Spotlight on

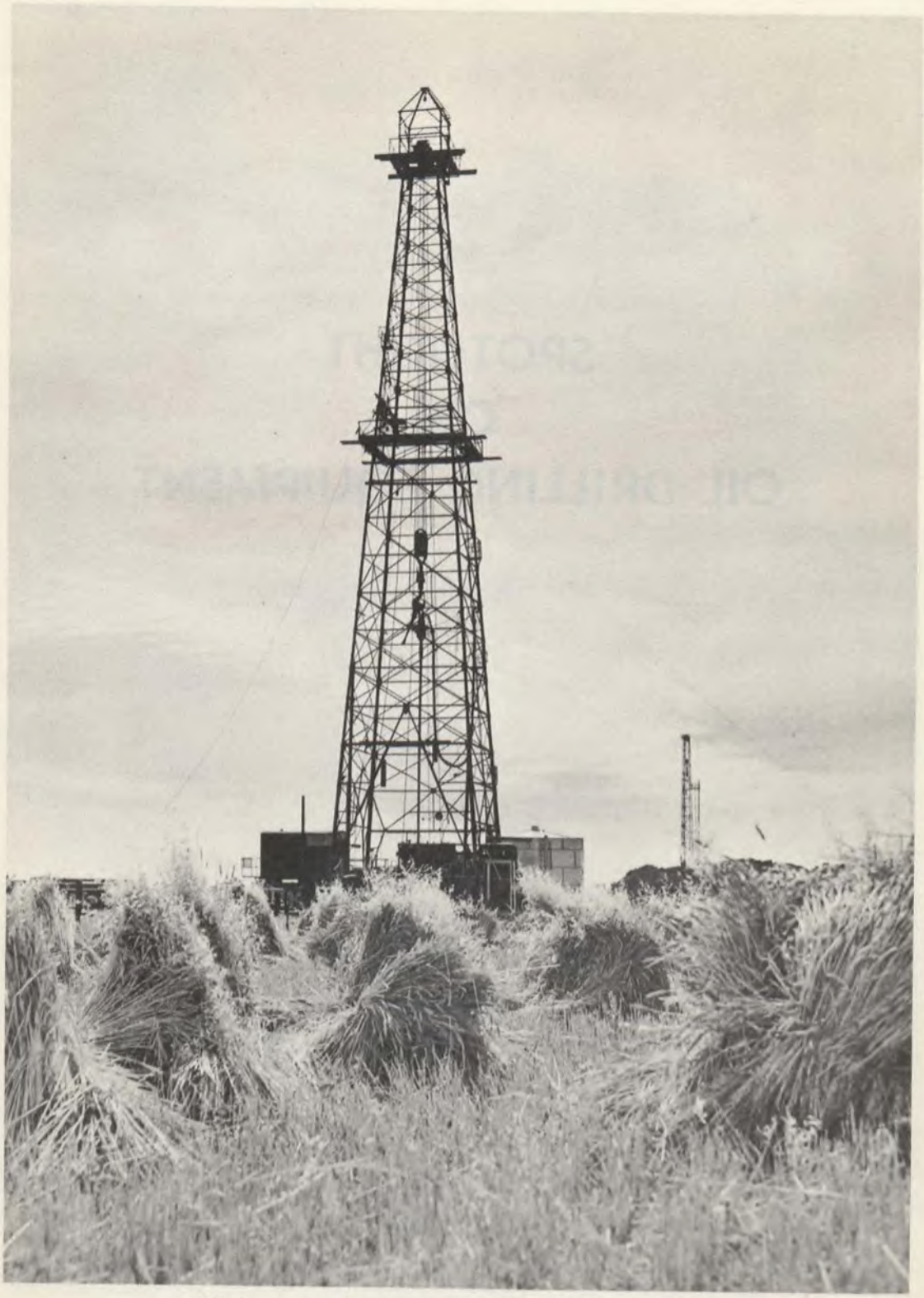
OIL DRILLING EQUIPMENT

DEPARTMENT OF TRADE AND COMMERCE, OTTAWA, CANADA

SPOTLIGHT ON OIL DRILLING EQUIPMENT

Prepared by
The Industrial Promotion Branch,
Domestic Commerce Service,
Department of Trade and Commerce
Ottawa

November, 1961



Oil rigs tower above the golden wheat fields of the west.

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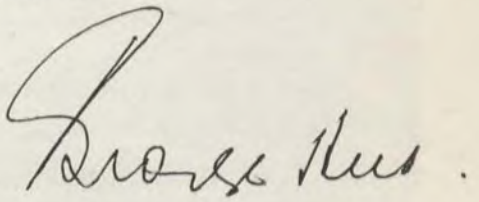
FORWARD

Secondary industry in Canada has grown considerably in recent years and has become much more diversified. Nevertheless, many opportunities exist for further industrial expansion. It is the policy of the Government to encourage Canadian businessmen to develop these opportunities thereby fostering high levels of industrial employment and production. The co-operation of industrial consumers, distributors, manufacturers and other interested parties co-operate fully in order that full advantage can be taken of them.

In November of 1960 the Government announced the National Oil Policy, whereby the production of Canadian petroleum would be increased substantially. An integral part of oil production is exploration and drilling. Substantial quantities of a wide variety of equipment are used in these operations. At the present time, Canadian manufacturers supply a relatively small part of these requirements. I believe, however, that Canadian production of oil drilling equipment can be increased progressively. It will be necessary for domestic manufacturers to pursue, with energy and perseverance, the opportunities to increase their participation in this market. At the same time, distributors and users of this equipment must show a willingness to handle those Canadian products which meet the required standards of price, service and dependability.

I am sure that all concerned will take the steps necessary to bring about increased Canadian production of oil drilling equipment.



George Hees,
Minister of Trade and Commerce.

INTRODUCTION

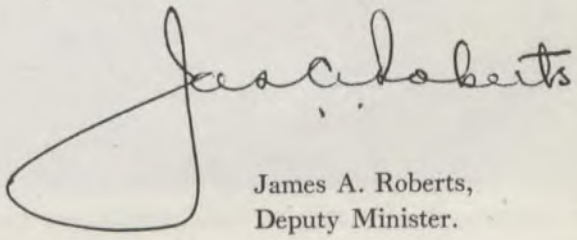
This is the first of a series of reports, to be known as the "Spotlight Series", which are intended to provide information that will assist in industrial promotion in Canada.

These reports will provide information about market opportunities for a variety of manufactured goods. Realizing the value of accurate and detailed marketing data to industry when seeking out new opportunities for expansion, each report will contain as much detailed information respecting size of markets, breakdowns of product groups, etc., as is practicable.

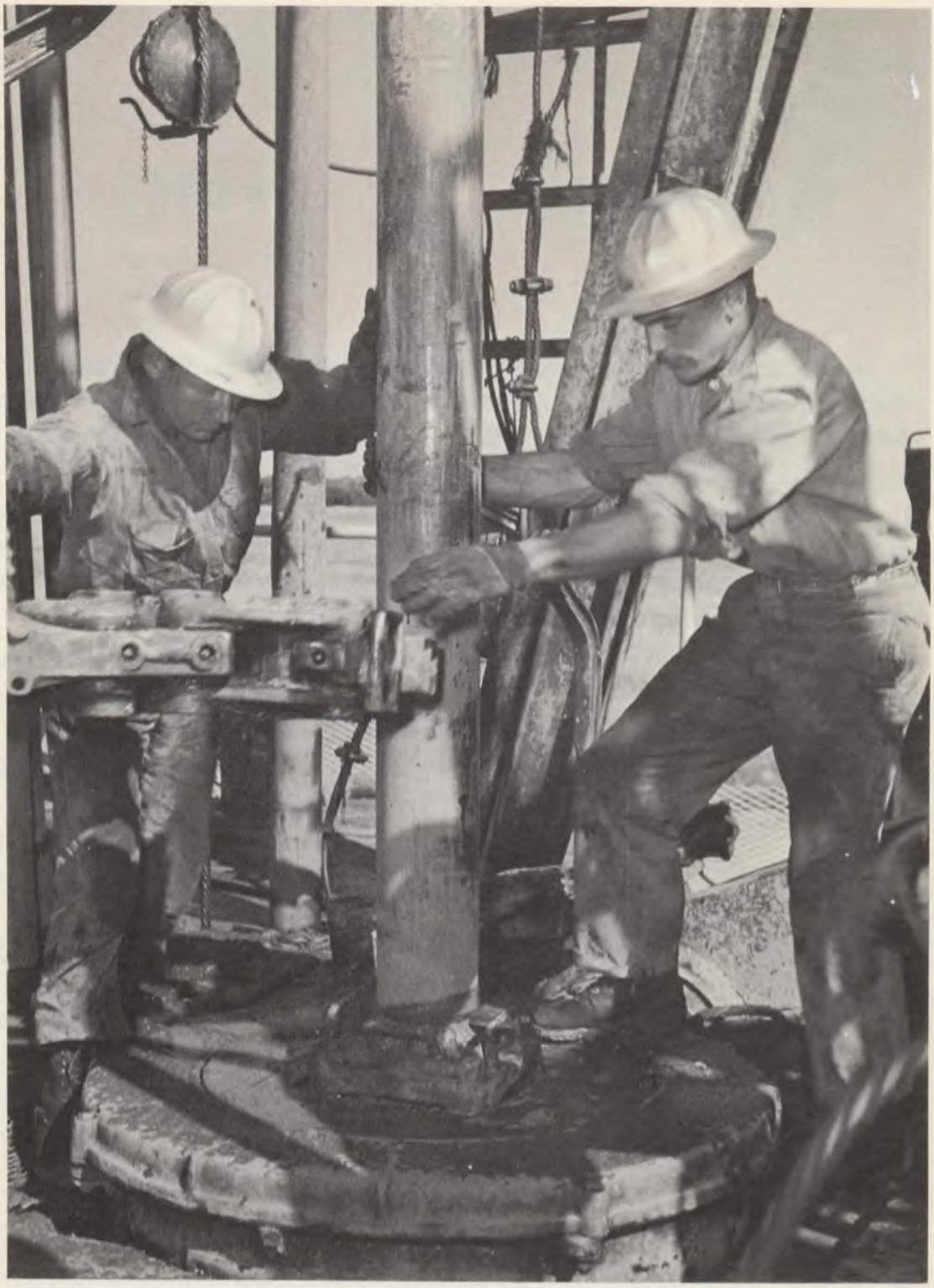
Each study in the series is also intended to disclose those factors, economic and other, which influence the markets, the trade, and domestic production in the manufactured product or products under consideration. They should help reveal those advantages which Canadian industry has in making a product and may perhaps throw light on how these can be further developed.

Another purpose of the reports will be to divulge those obstacles or handicaps which face domestic industry in the production of manufactured goods. It is believed this information will be useful to industry, and to Government, in the task of fostering greater output and employment in secondary industry in Canada.

These studies are being undertaken in the Industrial Promotion Branch, Domestic Commerce Service, Department of Trade and Commerce.



James A. Roberts,
Deputy Minister.



Workmen join pipe ends, called "spinning it in", at the Imperial Oil Ltd. fields north of Edmonton, Alberta.

SUMMARY

The market for oil drilling equipment in Canada amounts to more than $50 million each year. When fees for installation and servicing of equipment are added, the total market is much larger.

The level of demand for oil drilling equipment is directly related to activity in the oil industry and the rate at which exploration is carried on. The National Oil Policy announced by the Minister of Trade and Commerce has already achieved increased levels of oil production. Because of this growing rate of production, there will be a continuing need to locate new oil and gas fields in order to maintain present reserve ratios.

Oil drilling equipment consists of a wide variety of machinery and components used in drilling oil and gas wells. In the marketing of this equipment, proven dependability and good servicing are of key importance. Many types of equipment are considered to be "critical" in the sense that a breakdown of a single part or component can stop the entire drilling operation. It may also result in the necessity for costly recovery or repair activities. Most drilling contractors and oil companies purchase on a "brand name" basis because of the necessity of using components of proven reliability. That is, they buy equipment made by companies with a record of reliability. These companies are constantly carrying on research and testing to improve their products.

Equally important as reliability is the need for good servicing. As a result, it is usually essential that there be adequate stocks of components, close to the drilling operations, which can be delivered to the drilling site within a matter of hours. In many instances component suppliers have field men who are in constant touch with the drillers.

Nearly all drilling equipment used in Canada is imported from the United States, where manufacturers have had many years of experience in making this specialized equipment.

Most oil drilling equipment is sold to the drilling contractors and the oil companies through "supply houses". With one exception, all of the major supply houses in Canada are branches or subsidiaries of supply houses in the United States. These houses, in turn, are subsidiaries or divisions of steel or machinery producers in the United States and are major producers of oil drilling equipment. To a considerable extent, the supply houses regard their Canadian operations as an extension of their United States market and tend to centralize their purchasing policies at their head offices in the United States. As a result, a Canadian manufacturer wishing to market his product in Canada often must obtain acceptance from the head office of the United States parent house.

Canadian manufacturers' participation in the market is at present confined to a relatively few items, to a limited amount of processing, and to repair and maintenance. A survey of 1500 Canadian machinery manufacturing and repair firms indicates, however, that a considerable number of companies wish to enter or expand in this field. Among the Canadian firms which are already producing components for oil and gas drilling, a number stated that the most feasible means of expanding Canadian output is through licensing arrangements with established producers in the United States. In this manner, the domestic producer is able to market his product under an established brand name. Furthermore, he benefits from the development work carried on by the licensor, which would often be beyond the means of Canadian manufacturers. There is little doubt that with appropriate encouragement, and co-operation between the various interested parties, Canadian production can be increased progressively.

"Christmas Tree" and branching pipes are generally found on the site of capped wells once the derrick is removed.

SPOTLIGHT ON OIL DRILLING EQUIPMENT

BACKGROUND

Oil drilling equipment consists of a wide variety of machinery and components used in drilling oil wells. Basically it covers the equipment used in drilling, the wellhead components and much of the apparatus used in exploration. Included are drill bits, diesel motors, drill rigs, pumps, mud and an extensive range of other types of machinery. More than $50 million of oil drilling equipment is purchased in Canada each year and the great bulk of this is imported.

The demand for oil drilling equipment is directly related to oil production and the rate at which exploration is carried on. As existing sources of oil are depleted, oil companies are continually exploring for new sources of oil with a view to ensuring a number of years of proven reserves at anticipated levels of consumption. The rapid growth of oil production in Canada in the postwar period greatly increased the market for oil drilling equipment. Although this market has now existed for fifteen years, Canadian manufacturers participate in it to only a limited extent.

One of the purposes of this report is to make Canadian manufacturers aware of opportunities in the production of equipment for oil and gas drilling. Also, it is intended to make distributors and users of oil and gas equipment aware of Canadian capacity to produce such equipment. An important additional objective is to inform manufacturers in other countries of Canada's desire to increase production within this country, under licensing or other arrangements. This study indicates that the market in Canada for many such products is now large enough to support domestic production on an economic basis.

In order to obtain first hand information about the manufacture, distribution and use of oil drilling equipment, officials of the Domestic Commerce Service, Department of Trade and Commerce, visited Canada's Prairie Provinces and held confidential discussions with representatives of Canadian manufacturers, supply houses, drilling contractors and oil and gas producers.

In all of this work, officials of the Department had the active and extensive co-operation from the Department of Industry and Development, Edmonton, the Department of Industry and Information, Regina and the Department of Industry and Commerce, Winnipeg. Various trade associations also gave valuable time and assistance to the Department in this project.

This worker is centering the drill bit before it is run down through the hole.

GROWTH OF OIL DRILLING

The development of the oil and natural gas fields in Western Canada is typical of the rapid expansion of many Canadian resource industries. Despite this expansion, abundance of oil and gas reserves in Canada is still to be measured with any degree of precision. Each year new sources are located and each new discovery stimulates further exploration.

Since the discovery of the Leduc field, the industry has continued to invest large sums for the discovery of new fields, for processing plants, for collecting lines, and for marketing facilities. From a modest expenditure of $53 million in 1947, the peak of capital investment in the petroleum industry in Canada was reached during 1957 when expenditures amounted to over $780 million. It is estimated that nearly $6 billion for capital investment will have been spent from 1947 to the end of 1961.

CAPITAL INVESTMENT IN THE PETROLEUM INDUSTRY
($'000,000)

	1947	1951	1953	1956	1957	1959	Total 1947-59
Exploration, development and production	10	72	166	326	315	277	2,177
Transportation, oil and gas pipelines	3	11	80	177	310	50	1,141*
Refineries	25	51	66	79	81	110	844
Marketing facilities	15	18	37	68	75	92	539
Totals	53	152	349	650	781	529	4,701

* — *Includes $720 million invested in natural gas pipelines and compressor stations.*
Source: Dominion Bureau of Statistics.

Expenditures for exploration and development loom large. The continuing need to maintain adequate reserves of oil and gas to replace depletion resulting from the rapid increase of consumption over the past decade in North America, makes this country a logical exploration area. It is estimated that there are over a half a million square miles of geologically favourable oil and gas territory available for future development in Canada. The geographical location of these fields on a continent that consumes about half of the world's production of oil and gas, coupled with Canada's favourable investment climate, further attracts capital to this industry.

Direct expenditure in oil field exploration, apart from drilling, averages approximately $65 million per year. Oil and gas well drilling expenditures have averaged in the neighbourhood of $175 million per year. The following Table shows that expenditures for drilling have increased substantially over earlier years.

VALUE OF NEW AND REPAIR CONSTRUCTION WORK PERFORMED
OIL AND GAS WELLS
($'000)

	1951	1953	1956	1957	1960	1961
Oil wells	55,568	72,695	191,092	166,081	131,886	131,122
Gas wells	—	12,567	11,612	23,143	54,505	48,398
Totals	55,568	85,262	202,704	189,224	186,391	179,520

Source: Dominion Bureau of Statistics.

DRILLING ACTIVITY IN CANADA (PETROLEUM AND NATURAL GAS)

	1955	1957	1959	1960
Footage	13,198,865	14,576,080	13,070,138	14,168,857
Average depth	3,950	4,230	4,590	5,010

RANGE IN RIG ACTIVITY (WESTERN CANADA)

	1957	1958	1959	1960
Total available rigs*	337	339	331	312
Minimum in use during year	150	117	150	112
Maximum in use during year	285	253	252	270

* — *Includes all rigs moving into sites, tearing out, drilling, or unable to drill because of road ban.*
Source: National Energy Board.

Forecasts vary as to the amount of drilling activity likely to be completed in Canada over the next five years. Nevertheless, it is believed that at least the present level of activity will continue into the future. If the existing ratios of production to reserves are to be maintained, new fields must be discovered at an even faster rate than existing fields are being depleted.

The opening of Canada's North has further extended the frontiers of oil and gas exploration. During the summer of 1961, there has been an active programme of exploration and drilling in the Arctic. Coupled with the National Oil Policy, the development of the Arctic is likely to encourage drilling activity.

The announcement of a National Oil Policy by the Minister of Trade and Commerce has already been effective in achieving increased levels of oil production. In line with the announced policy, it is anticipated that rates of production will continue to increase and by 1975 are expected to be nearly double present levels. Because of the growing rate of production there will be continuing need to find new oil and gas fields to maintain present reserve ratios.

OIL DRILLING EQUIPMENT IN OPERATION

The drilling rig is the most obvious of all the equipment used by drillers and is symbolic in the public's mind of the oil and gas exploration industry. The rig consists of a multitude of components, including wire rope, diesel engines, pumps, mud, wire screens, bulk tanks, rubber hose and steel masts. In addition to the rig, there is the "down-hole" equipment consisting in part of drill pipe, drill bits and casing pipe. Most of this equipment is specifically designed and produced for oil and gas well drilling. Some of the other items are general purpose products, not specifically designed for drilling, e.g., wire rope, pressure gauges, etc. The cost of a fully equipped drilling rig can exceed $250,000.

No two drilling rigs are identical, although many of the parts are interchangeable. However, all rigs perform the same basic function, that is, they drill a hole in the ground by rotating a bit at the end of a string of drill pipe. Often the hole will be more than a mile in depth and sometimes more than two miles.

A drilling rig is not a single unit, but is composed of a series of integrated parts which work together to keep the "bit on the bottom and turning to the right". These parts are designed for different capacities and are matched so that they complement each other. The design and matching of these units again depends to a large extent on the experience of the engineer or driller. In spite of the individuality of each rig, all rigs consist of four major groupings of components. These are: 1) The mast or derrick; 2) The draw works; 3) The power supply; 4) The mud system.

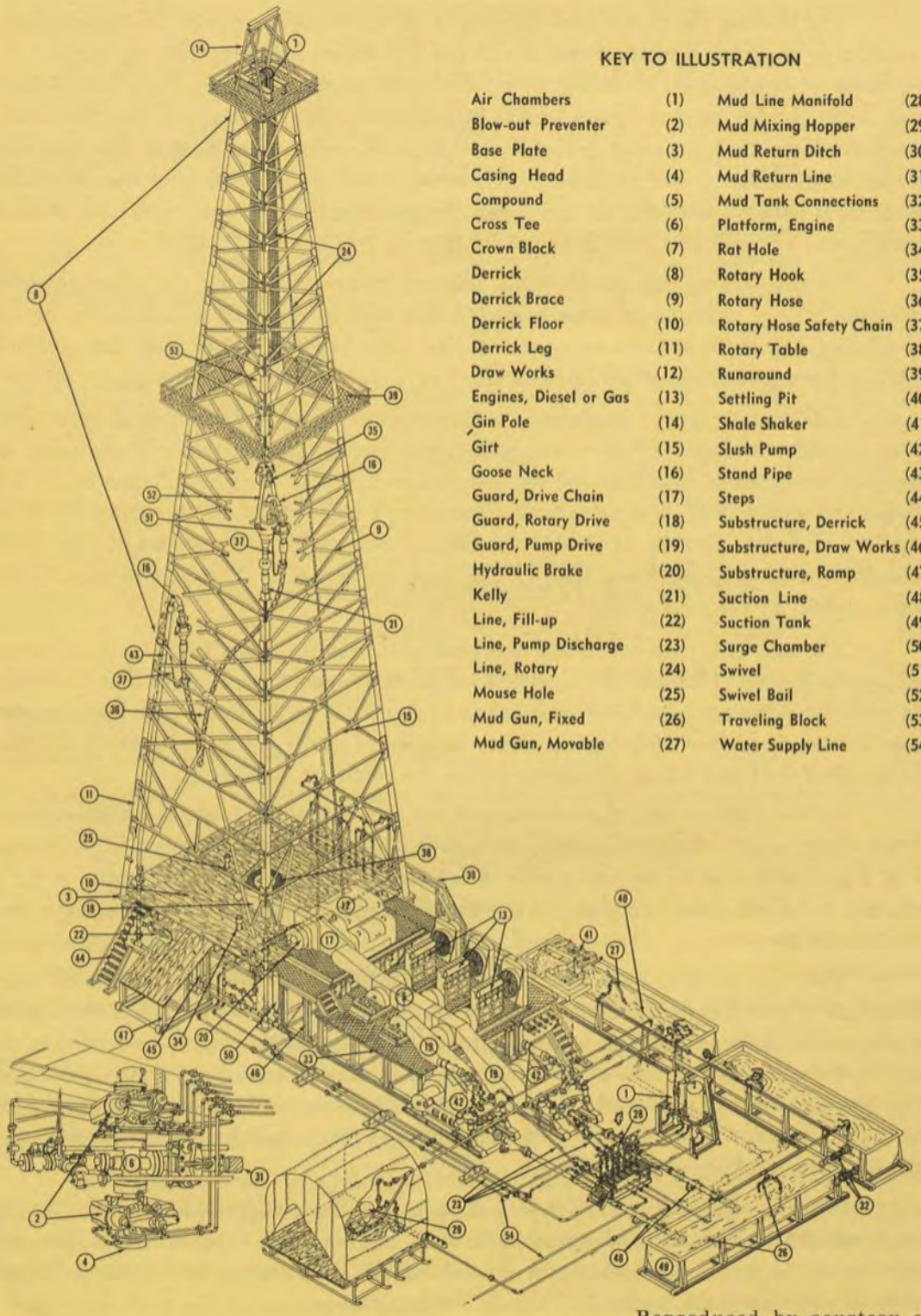
The *mast* or *derrick* consists of structural steel mounted on a platform or substructure above ground level. This provides clearance for the wellhead equipment and control devices. As a rule, the structural steel derrick is bolted so that it can be dismantled for transportation from one site to another. Hoisting equipment is mounted on the derrick as a means of lifting the string of drill pipe which is suspended from the centre of the derrick.

On the platform and approximately in the centre of the derrick is a "rotary table". A drill shaft, called a "kelly" is inserted through the rotary table with the drill pipe attached to it. Power is applied to the rotary table which turns the kelly and the drill pipe. A bit is attached to the end of the drill pipe and it is the chewing action of the bit while being turned which drills the hole.

The *draw works* consists mainly of a hoisting drum and control mechanism. A heavy steel cable is wound on to the drum. From the drum, the cable goes to the top of the derrick, passes over a "crown block" and is attached to a travelling block which is suspended in the middle of the derrick. The travelling block in turn, is attached to the top of the drill string. The function of the draw works is to suspend the drill string in the hole and to lift it from the hole as required. Since the drill string may be more than a mile in length, it is necessary that the draw works have great strength.

Power is supplied to the drilling rig by a bank of diesel engines. Each engine usually has from 125 to 150 h.p. and six or eight such engines form a power plant. The unit provides all the power requirements for the drilling rig, for hoisting, for turning the rotary table, for circulating the mud and all the ancillary operations.

DRILLING RIG



KEY TO ILLUSTRATION

Air Chambers	(1)	Mud Line Manifold	(28)
Blow-out Preventer	(2)	Mud Mixing Hopper	(29)
Base Plate	(3)	Mud Return Ditch	(30)
Casing Head	(4)	Mud Return Line	(31)
Compound	(5)	Mud Tank Connections	(32)
Cross Tee	(6)	Platform, Engine	(33)
Crown Block	(7)	Rat Hole	(34)
Derrick	(8)	Rotary Hook	(35)
Derrick Brace	(9)	Rotary Hose	(36)
Derrick Floor	(10)	Rotary Hose Safety Chain	(37)
Derrick Leg	(11)	Rotary Table	(38)
Draw Works	(12)	Runaround	(39)
Engines, Diesel or Gas	(13)	Settling Pit	(40)
Gin Pole	(14)	Shale Shaker	(41)
Girt	(15)	Slush Pump	(42)
Goose Neck	(16)	Stand Pipe	(43)
Guard, Drive Chain	(17)	Steps	(44)
Guard, Rotary Drive	(18)	Substructure, Derrick	(45)
Guard, Pump Drive	(19)	Substructure, Draw Works	(46)
Hydraulic Brake	(20)	Substructure, Ramp	(47)
Kelly	(21)	Suction Line	(48)
Line, Fill-up	(22)	Suction Tank	(49)
Line, Pump Discharge	(23)	Surge Chamber	(50)
Line, Rotary	(24)	Swivel	(51)
Mouse Hole	(25)	Swivel Bail	(52)
Mud Gun, Fixed	(26)	Traveling Block	(53)
Mud Gun, Movable	(27)	Water Supply Line	(54)

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The *mud system* performs very important functions in drilling. A swelling type bentonite or barytes with various chemical additives is pumped through the drill pipe to the bottom of the hole where it emerges through openings in the drill bit. It then returns to the surface by being forced up along the outside of the drill string. On returning to the surface, the mud is screened to remove impurities washed up from the hole. The cuttings provide geological information to the driller.

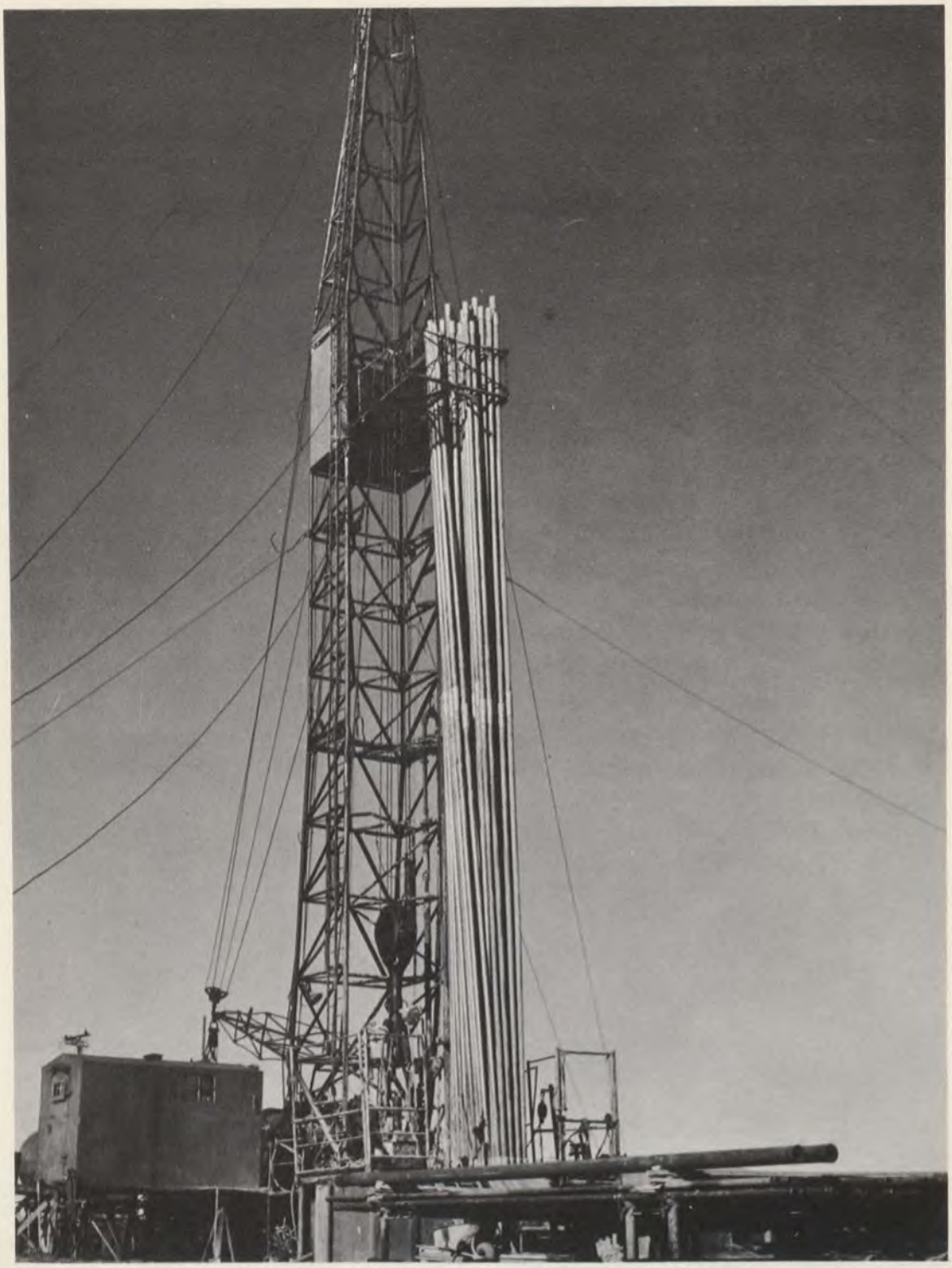
The functions of the mud system are: (a) to improve the cutting by cooling the drill bit and washing the cuttings to the surface, (b) to coat the surface of the drill hole in order to reduce seepage of water and gases into the hole, (c) to lubricate the drill string, (d) to give buoyancy or support to the drill string.

Once a hole has been drilled, it must be protected against cave-ins and contamination. This is done by inserting steel casing, which is a form of pipe. Once the casing is in place, cement is poured between the casing and the wall of the hole. At the top of the hole, a "christmas tree" or some form of wellhead equipment is attached. This is a series of valves which control the flow of the oil or gas and supports the producing pipe.

A drilling rig operates 24 hours a day. It has three crews, often with eight or more men per crew. Since the operating costs of a rig are very great, drilling contractors must avoid shut-downs wherever possible. A break in drill pipe, for example, will likely mean that the broken pipe must be "fished" from the hole and replaced. Such an operation can delay drilling for days and results in very heavy additional costs to the drilling contractor. As a consequence, drillers take extraordinary precautions against breakdowns.

The above is a simplified outline of a complex operation. For those who seek more detailed knowledge, there are a number of definitive texts. It is believed, however, that this description is sufficient to give the lay reader a glimpse of the problems of oil drilling.

Drilling derricks in the Leduc oil fields of Alberta.



Imperial Oil Well No. 34 at Redwater, Alberta. "Pulled" drill pipe is shown racked at the right of the well. At the top of the derrick is a "Windbreak", used to shelter the derrick man pulling pipe, from the force of the wind.

DRILLING CONTRACTORS

The early development of the oil and gas industry in Canada had, of necessity, to rely upon the skills and equipment of drilling contractors from the United States. With the discovery of the oil fields in Western Canada, drilling crews and complete rigs were moved from sites in the United States to Alberta and other exploration areas in Canada. These drilling contractors brought to Canada the skills, knowledge and methods of drilling operations used in the oil fields of Texas, Oklahoma and California. Without their assistance, it would not have been possible to develop the oil and gas industry at the rate which was achieved in the earlier days.

As time passed, Canadians acquired drilling skills and a number of Canadian drilling companies were formed. Today the majority of the drilling contracting firms are Canadian-owned and employ Canadian personnel. While these firms have acquired certain skills peculiar to drilling in Canada, basically their operations are comparable to those of drilling contractors in the United States.

Most drilling contractors in Canada have a limited number of rigs; a few have from twenty to thirty rigs. With a few exceptions, the rigs are independently owned. Some are owned by the oil companies, usually for use in "tight holes", where the company wishes to keep the drilling results highly confidential. In certain other instances, drilling contractors are tied in with supply houses.

Drilling contracting is highly competitive and in recent years there has been a number of failures and mergers. Also, the new holes being drilled are becoming deeper, requiring larger and more powerful equipment, and greater resources and skills.

The drilling contractors are usually employed under contract by the oil producers. When an oil company obtains exploration rights, it usually hires a drilling contractor to drill exploratory holes. This hiring is normally done by tender and is highly competitive. With the exception of the few rigs owned by the oil producers there is usually no corporate relationship between the drillers and the large oil companies.

Most oil drilling equipment is purchased by the drilling contractors. However, certain important components such as casing pipe, in some cases drill bits, and most of the wellhead equipment are usually purchased by the oil producer. The wellhead equipment includes pumping jacks, down hole pumps and wellhead assemblies.

It is of vital importance to the driller to keep his rigs operating at maximum efficiency. Often he is drilling on a very tight schedule in order to meet contract deadlines. In many instances, he is paid on the basis of footage drilled. Thus there is great incentive to keep the rig operating at full capacity. Should the rig break down, either because of faulty equipment or because of unforeseen underground conditions, heavy operating costs continue to be incurred. In addition, there are the costs of new components, possible repairs to equipment and the hole, and the cost of "fishing" for lost downhole components. It is essential, therefore, that contractors take all possible precautions to avoid shut-downs.

Obviously, reliability is a prerequisite of oil drilling equipment. In order to ensure the standards of such equipment, most specifications are laid down by the American Petroleum

Institute (A.P.I.). These are minimum standards and manufacturers often voluntarily raise their specifications. As a rule, a contractor will not purchase equipment which does not meet A.P.I. standards.

The reputation of the equipment manufacturer is a further guarantee of quality. A number of manufacturers in the United States have been making oil drilling equipment which has been sold in world markets for many years. These manufacturers often invest large sums in engineering and development in order to bring about continual improvement in their products. As a result these firms have created confidence in their products and a reputation for reliability among drillers. As a consequence, a substantial portion of the equipment purchased by drillers is on a brand name basis. The driller knows that the product of a particular company has been proven over many years of field use and he buys this product with the assurance that it is the best available for his needs. Often, for critical components, price is a secondary consideration; the important thing is to know that the product is not likely to break down except in exceptional circumstances. Because of his reliance on brand names, the driller often is reluctant to test the product of a new manufacturer of oil drilling equipment.

Equally important with quality is service. The driller must be assured that there is a readily available source of supply for any component which he is likely to need. The established manufacturers of many types of equipment, especially those types which are subject to frequent replacement, have highly developed service facilities. It is essential that there be an adequate supply of spare components readily accessible to the drillers. Often this will mean being in a position to deliver a component to a drilling site in a matter of hours.

A number of component manufacturers maintain sizeable field staffs in and around the main centres of drilling activity in order to provide this service to the drillers and the oil producers. This staff ensures that components are available, are delivered on schedule, and are properly installed. To a considerable extent the driller is dependent on these field representatives who also give advice on a variety of technical questions.

Briefly, the driller must minimize the risk of shut-downs. As a result, he purchases known and proven brands of equipment, which meet A.P.I. standards and which are readily available to him. In addition, these components are backed by competent and available service and technical staff.

More than 100 of these rotary bits are required to drill a single well.

SUPPLY HOUSES

As mentioned earlier most of the equipment purchased by drilling contractors in Canada is manufactured in the United States. When drilling operations first started on an extensive scale in this country, drillers from the United States brought their equipment with them. In most instances, comparable Canadian-made equipment was not available. As drilling operations increased, United States supply houses opened branches in Canada to supply and service drilling contractors. At first most of the customers were transplanted drillers from the United States. When a number of Canadian-owned drilling companies were formed, these too had to look to the same supply houses for their requirements. Furthermore, drilling equipment moved readily into Canada on a duty-free basis. It can be said that the market for oil drilling equipment in Canada has continued to be an extension of the United States market, with the imported equipment being largely distributed through branches of United States supply houses.

As a rule, the drillers do not deal directly with the manufacturers; most oil drilling equipment is sold by or through the supply houses.

The supply houses normally deal only in equipment for the oil industry. Each carries a wide range of components in warehouses located near the oil fields. Thus, they are in a position to provide replacement parts on short notice. Also, the employees of supply houses have a knowledge of all the products available for efficient drilling and can integrate the various components to satisfy the needs of a drilling contractor. In a broad sense, the supply house is the department store of the oil drilling industry, but in addition, it also provides advice on a variety of subjects and gives on-the-spot service to the driller.

There are only a few major supply houses in Canada. Each operates a number of warehouses and offices in close proximity to the oil fields. In addition to these large supply houses, there are a number of smaller specialty houses which deal in limited ranges of products.

With one exception, the major supply houses are branches of supply houses operating in the United States. The parents in turn are subsidiaries of steel or machinery producers in the United States. In some cases a subsidiary firm has been incorporated in Canada while in other cases business is carried on through unincorporated branch offices. The names and chief affiliations of these companies are noted below:

1) National Supply Company—a subsidiary of Armco Steel Corporation, Pittsburgh;

2) Oil Well Supply Division, United States Steel Corporation, Dallas;

3) Continental Emsco Company Ltd., a subsidiary of Continental Emsco Company of Dallas, a division of Youngstown Sheet and Tube;

4) Jones and Laughlin Steel Sales Co. Ltd. (Supply Division), Tulsa;

5) Mid-Continent Supply Company, Tulsa.

For practical purposes these supply houses may be considered as manufacturers' sales outlets. They promote the sale of their parent companies' products and provide servicing facilities. In order to round out their lines they also carry products of other companies

producing non-competing lines. While the supply houses are reluctant to carry products made by competing firms, representatives of certain houses stated that they occasionally are asked to do so by a driller who has a particular preference. Rather than run the risk of losing his patronage, they will accommodate him.

Representatives of some supply houses in Canada indicated that they did not have the authority to purchase oil drilling equipment made in Canada without prior authority from their parent company. Before a new Canadian-made line can be purchased by a branch of a supply house operating in Canada, it must be approved through the central purchasing department at the company's head office. After such authority has been received, the Canadian office is usually free to make local purchases, if it so desires.

Sizeable amounts of capital are required to finance a supply house. The inventories of equipment on hand are large and costly and turnover of certain types of equipment is slow. Furthermore, it appears that the supply houses often extend credit to drilling contractors, sometimes over considerable periods.

The one large Canadian-owned supply company, Dominion Oilfields Supply Company Ltd., is closely related to two of the largest drilling companies in Canada. Without doubt, an extensive part of the business of this house is with its two affiliated drilling companies. This firm is not related to equipment manufacturers in the United States or Canada.

At Imperial Oil Well No. 34 at Redwater, Alberta, the driller, who handles the lead tongs, and the cathead operator release pressure off the casing on the cement head. Cement is poured down the 7-inch casing and, by pressure, up around the pipe.

CANADIAN MANUFACTURERS

Although the bulk of oil drilling equipment used in Canada is imported from the United States there is, nevertheless, Canadian production of a range of components. It would appear, however, that capacity exists in Canadian industry to increase production progressively of a wider range of equipment.

Existing facilities in Canada fall into a number of categories:

Servicing and Repair: With the growth of the oil industry in Alberta, a number of machine shops were established or expanded to service the industry. These shops could and did provide prompt service to the drillers and the oil producers. Often they have been called upon to replace components on short notice. Over the years, many of these firms have acquired a detailed knowledge of certain types of drilling components. As their equipment has improved, they have sometimes begun manufacture of a particular component which lends itself to machine shop production. In some instances, the machine shops do process work, such as threading and turning a component supplied by one of the large equipment manufacturers. These finishing operations, performed in Alberta, enable the manufacturer in the United States to ship his product without fear of damage in a much more economic manner than would be the case if they were already finished. Also, there are certain advantages to stocking only the blank forms, which can be threaded to the particular needs of the customer.

The major business of the machine shop is the repair and overhaul of used equipment. A number of these firms now wish to expand their processing operations. They believe they have acquired sufficient knowledge and experience, plus adequate equipment to undertake further processing of unfinished components.

Assembly Operations: A number of equipment manufacturers at present ship their products to Canadian branches in knocked-down condition; the branch then assembles the components in whatever combination the user specifies. Wellhead assemblies, pumping equipment, instruments and tank components are indicative of the range of equipment which enters Canada for assembly. These operations are not manufacturing; the local branches are warehouses, service depots and assembly and sales centres.

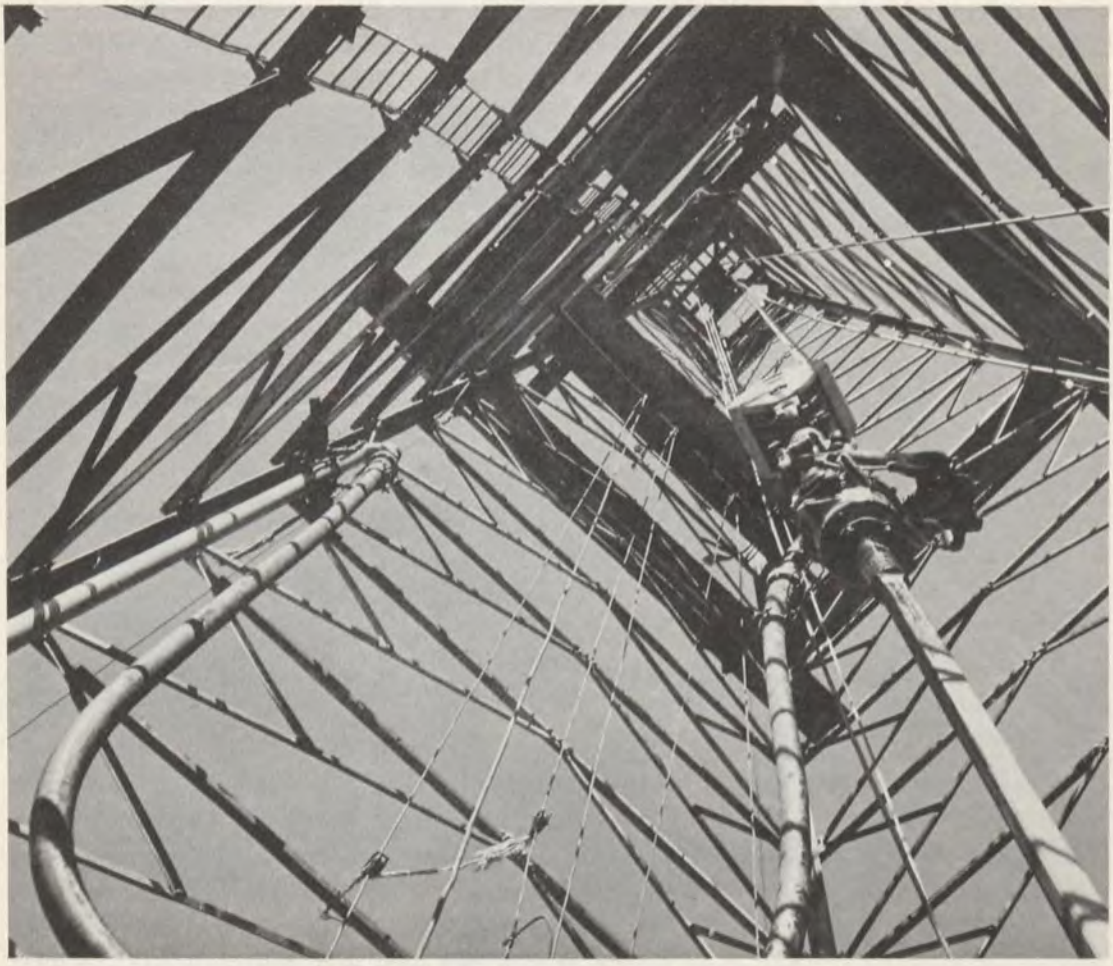
Many industries have had their beginning in assembly operations and over the years have expanded, step by step, into processing in Canada. There are indications that a number of Canadian branches of United States firms in the oil drilling equipment field either are taking the first steps to manufacturing in Canada or are considering such steps. In many instances, the local processing starts with the installation of a machine shop to finish the rough forgings, castings or blanks which are obtained from the parent company or from other sources.

Manufacturing: A number of companies manufacture complete oil drilling components in Canada. Perhaps the outstanding example is sucker rods, which are manufactured by Premier Steel Products Limited at Edmonton. A sucker rod is a high grade steel rod which connects the pumping jack at the top of the wellhead to a pump at the bottom of the well. This equipment is used on low pressure wells to bring the oil to the surface. The Canadian market for sucker rod amounts to several million feet each year and until recently most requirements were imported. Premier's output is completely integrated since it starts with

scrap as a raw material and melts, rolls, heat treats, forges and threads the rod. This firm now supplies the bulk of Canadian demand for this product. Discussions with users and distributors indicate that Premier produces a dependable product of good quality and gives first rate service to its customers.

Other products which are manufactured in Canada for oil drilling include rubber hose, screens, pumping jacks, seismographic drilling bits, centralizers, scrapers, scratchers, wire rope, fluid end parts for pumps, coring bits, welded tanks, casing, fishing tools, compressors and parts, and valves.

A survey in July 1961 of approximately 1,500 machinery manufacturing establishments and machine shop operations in Canada showed that approximately 100 were producing or processing oil well drilling equipment. Most of these companies were located in Alberta. In addition, some 200 firms stated that they are making products similar to oil drilling equipment. While many of these firms may not be aware of the complexities of manufacturing and servicing oil drilling equipment, a number of companies which indicated an interest would appear to have the capabilities of manufacturing some types of equipment.



Looking up inside an oil rig in the Leduc fields of Alberta.

PROBLEMS FACING CANADIAN PRODUCERS

Canadian producers and potential producers of oil drilling equipment have faced, and continue to face, serious problems. A number of these were mentioned by various manufacturers and are discussed below.

Specifications: To obtain market acceptance, production must meet the American Petroleum Institute's specifications. Producers indicated that this was not a problem and that approval from A.P.I. was readily obtainable provided its standards were met.

Brand Names: Most of the critical equipment is purchased on the basis of established United States brand names. Few Canadian producers have brand or trade names that are known in this field. Some producers have met this problem by arranging to do processing on imported components which carry brand names of United States manufacturers. In other instances, such as Premier Steel, the domestic producer has undertaken a major campaign to have its product accepted. This involved meeting A.P.I. specifications, obtaining acceptance of the product by the supply houses and oil producers, arranging for field testing, providing extensive field and service facilities, and taking prompt and adequate action to remedy any difficulties which faced customers in using Premier's product.

Service: Prompt service is of the greatest importance in selling oil drilling equipment. Time and time again, drillers stressed the essential nature of prompt deliveries, adequate stocks at the oil fields, and having skilled service personnel readily available. This often poses problems, particularly for small firms; however, while some are able to provide their own services, others rely on the supply houses for service to customers.

Research and Technical Development: Design and technical development of oil drilling equipment is constantly changing. In the United States, the larger manufacturers spend much time and money on research and technical improvement. Not all Canadian firms can afford to do this. In those instances where the domestic firms cannot provide the necessary development facilities, the solution is likely to be a licensing arrangement with a leading producer.

A number of Canadian manufacturers have found that the drillers are willing to experiment with new products, especially if they are not involved in a critical function. This field testing usually follows factory testing. It is an ideal method of proving a product under operating conditions and at the same time introducing it to the industry.

Supply Houses: The supply houses are perhaps the single most important factor in gaining access to the market. They can greatly assist a manufacturer in marketing his product. On the other hand, the lack of acceptance of a product by the supply houses raises very real obstacles for the manufacturer. At present, supply houses stock a variety of Canadian-made equipment. However some Canadian manufacturers have stated that it is often a lengthy and costly process to obtain acceptance of their product, especially if it competes with the products of the supply house's parent firm. It may mean numerous visits to the supply firms' head offices in Tulsa, Houston, or other centres. In fairness to the supply houses, they wish to be fully assured of the quality and acceptability of the new product.

Dumping: A number of domestic manufacturers said they had found it difficult to sell their products because manufacturers in other countries had lowered their export prices when

production began in Canada. These products were not subject to anti-dumping restrictions, not having previously been made in Canada. Since many of the Canadian producers are small companies with limited resources, they often could not meet such competition. Not being able to make sales, and thus supply ten per cent or more of the market, their products were not eligible for protection under the anti-dumping provisions of the Customs Tariff Act.

A workman examines drilling bits at the Imperial Oil Ltd. fields north of Edmonton, Alberta.

POSSIBLE DEVELOPMENT OF PRODUCTION

There is little doubt that there can and will be an expansion in the production of oil drilling equipment in Canada. The rate at which this expansion takes place will be influenced in large measure by:

1) the energy which Canadian manufacturers exert in attempting to enter this field,
2) the willingness of United States manufacturers to have certain processing carried on in Canada,
3) the readiness of supply houses to stock and promote the sale of Canadian-made equipment and,
4) the acceptance of Canadian equipment by drillers and the oil producers.

In addition to the above mentioned factors, such matters as exchange rates and the outcome of the present Tariff Board investigation will have an important bearing on the future production of this equipment in Canada.

Some of the Canadian firms attracted to this field may be large enough to carry on the required research and development. Even for large firms, however, the limited size of the Canadian market will make it difficult to recover expenditures for these purposes solely on the basis of domestic sales. As a consequence, it would seem that many Canadian firms, large and small, are likely to decide that there are advantages to entering into licensing or other arrangements with producers in the United States. A licensing arrangement usually means that the product can be marketed under the well established name of the licensor.

Manufacturers in the United States have often been reluctant to license their products for production or processing in Canada. This reluctance results from the fact that such companies have large productive capacities in their plants in the United States, where their operations are often fully integrated. There are indications, however, that some United States manufacturers are seriously considering certain production operations in Canada. As mentioned earlier, there are sometimes freight advantages in sending semi-finished items when damage to expensive finishings can occur in transportation or where on-the-spot custom processes are involved.

The elimination of the premium on the Canadian dollar has also made manufacture in Canada more attractive. The change in exchange rate of several percentage points affects considerably cost relationships between Canada and the United States.

Canadian producers sometimes have important advantages in the manufacture of certain types of products. In many instances they are smaller than their counterparts in the United States, and the smallness of their operations gives them a flexibility and a personal touch which often is important in reducing costs. Recently, several Canadian firms have undertaken to produce in Canada for North American markets, under arrangements with companies in the United States. In these instances, it was found that manufacturing in Canada was more economic than in the United States.

The supply houses hold one of the important keys to future production in Canada. The degree to which they are willing to handle Canadian-made products will in considerable

measure influence the rate of domestic entry into the market. In this respect, the establishment by the supply houses of appropriate procurement facilities in Canada with the authority to deal directly with Canadian manufacturers would assist greatly, particularly respecting new product lines.

The co-operation of the drilling contractors and the oil producers will also be important factors in determining future production. Both of these groups exist in a very competitive environment and must minimize their costs. However, both the drillers and the oil producers said they would support domestic producers who could provide reliable equipment at competitive prices with adequate servicing.

Any firm wishing to produce oil drilling equipment must make a careful examination of the products and the markets in Alberta. It is also essential that they thoroughly understand the needs of the drillers from direct contacts with them. A firm cannot hope to deal with this highly complex market from a distance.

A number of the items used in oil drilling in Canada are certainly within the present fabricating or engineering capacities of the more than three thousand firms in the Canadian metalworking industries. The market for many of these items is now large enough to offer the prospect of economic production to Canadian manufacturers.

This is a pioneer oil rig at Oil Springs, Ontario.

THE MARKET

It is difficult, if not impossible, to state precisely the size of the market in Canada for oil drilling equipment. From the point of view of consumption, a considerable portion of the cost to the driller or the oil company is for service. There is no available breakdown to indicate that portion of the cost which is attributable to the equipment and that which is service expense.

Import statistics in various special breakdowns have been compiled for the purposes of this report. It should be kept in mind that these statictics do not show the value of the services which are added in Canada. Neither do they reflect any further processing of such components undertaken in this country.

In most instances, statistics have not been compiled for domestic production of equipment used in the oil fields. One reason is that some of this equipment has a number of uses, and once it leaves the factory it is impossible to know its ultimate use.

It has been possible, however, to obtain a considerable amount of useful information about the market in terms of individual products and the value of imports of these products. In 1959, total imports of oil drilling equipment amounted to about $47 million. In 1960, total imports appear to have been approximately $45 million.

Two special tabulations of imports have been compiled in order to throw light on the apparent size of the market for specific types of equipment. These are as follows:

1) For August, 1960, the detail of all invoices valued at $1,000 or more

2) For major items, imports for each month in 1960

The detail of these breakdowns is shown in the Appendices.

The following discussion deals with the market for the more significant types of oil drilling equipment. (Appendix — Tables II and III)

Drill Bits and Parts: Drill bits and parts are the largest item in imports and consumption of oil drilling equipment. During 1960, imports were valued at approximately $11 million. The sales value of these bits would, of course, be appreciably greater because of the charges added for service.

Bits are manufactured in Canada for hard rock mining and for mining exploration and are protected by tariff. Canadian production of mining bits, which range up to 4¾ inches in diameter, was valued at about $5 million in 1960.

The only bits made in Canada for use in the oil industry are seismic bits, which are used in exploration work. These bits are similar to those used in mining. There is no production in Canada of rotary rock bits used in drilling producing wells. The design of the latter type of bit differs considerably from the mining and the seismic bit. Also, the rotary rock bits are larger than the seismic bits, the most popular sizes being from 7½ to 9½ inches.

Considerable skill and technical knowledge is involved in the manufacture of oil drilling bits. The manufacturers of such bits in the United States carry on continuous and extensive research and development to continually improve this key piece of drilling equipment.

There are four large producers of oil drilling bits in the United States. One of these, the Hughes Tool Supply Company, is the largest producer and supplies a substantial part of the Canadian market. This company, and its other United States competitors, offer extensive service and technical assistance to the drillers. Because the bit is a critical item in the drilling process, the driller is reluctant to experiment with new brands. As a consequence, this is one of the most difficult lines for a new producer to introduce. There is little doubt that entry would be greatly facilitated through a licensing arrangement with an established producer in the United States. An alternative would be for such a producer to establish a facility in Canada, perhaps in conjunction with a Canadian firm. The breakdown of imports indicates that the Canadian market for bits is sizeable and is concentrated in a limited range of sizes.

As mentioned previously, certain manufacturers in Canada are now producing seismic bits for oil exploration. Since a good start has been made in this field, it would appear that further expansion can be expected in the production and sale of this type of bit.

Wellhead Assemblies and Parts: The wellhead assembly or "christmas tree" is that equipment used to maintain surface control of the well. It consists of an assembly of valves which are cast or forged from steel and machined to close tolerances. It forms a seal which prevents well fluids from flowing or leaking at the surface. These are made to rigid specifications and in some instances are intended to withstand pressures of as much as 10,000 lbs. per square inch. At the other end of the scale there are simple assemblies designed merely to hold the weight of the tubing in the well.

Wellheads that are expected to have high pressures are equipped with heavy valves and control equipment above the tubing head. This group of valves is generally referred to as a christmas tree because of its shape and the large number of fittings which may at times be painted in different colours to designate their function. Even low pressure types of wells have some form of valve control and pressure gauge equipment incorporated into a simple type of christmas tree.

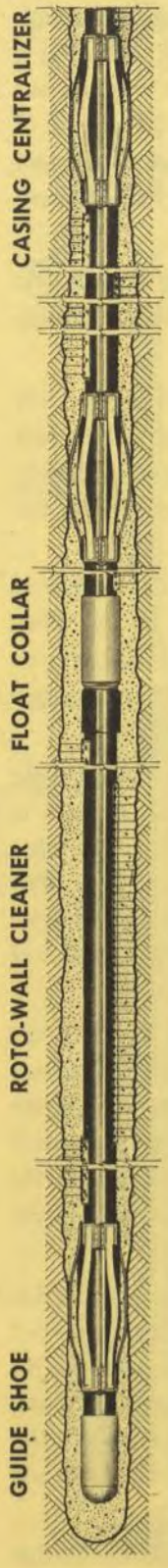
Wellhead assemblies are not made in Canada. They are forged or cast, machined in the United States, and are imported either as complete components for assembly or in assembled form for installation. It is difficult to state the quantity of imports because some are grouped with other products in the import statistics. There are indications, however, that imports exceed $1 million per annum.

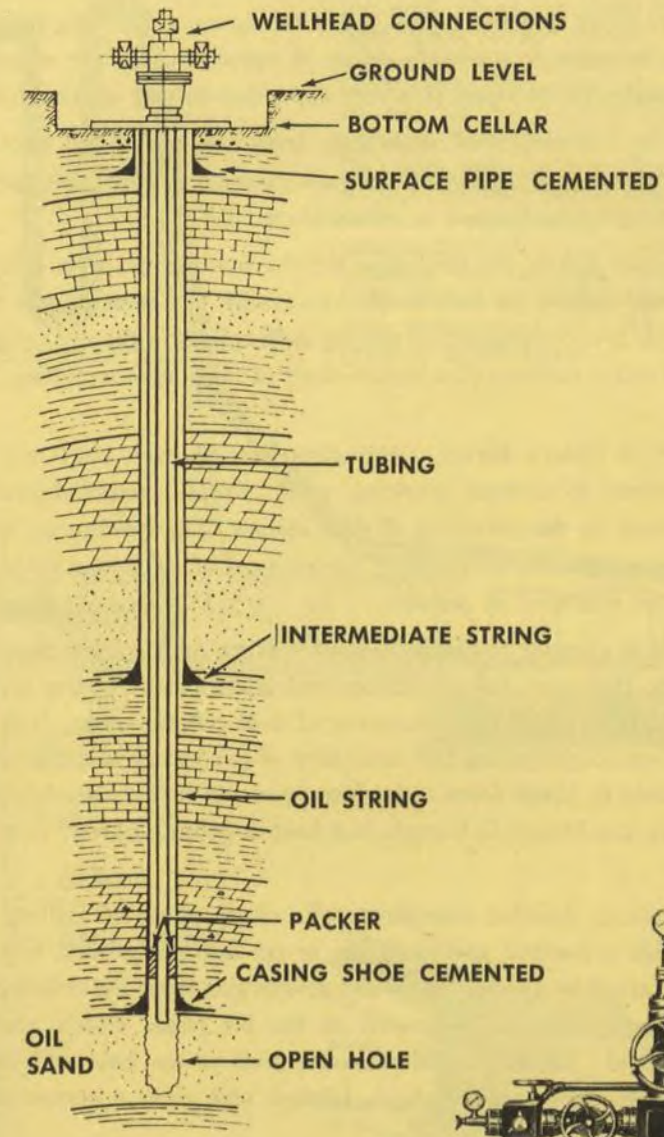
The forgings needed for high pressure assemblies are intricate and often involve the use of multiple head hammers. Such equipment is not available in Western Canada; certain manufacturers have said, however, that it would be feasible to do the machining in Canada on the imported forgings. Other manufacturers have indicated that it would be economic to make low pressure wellheads in the country.

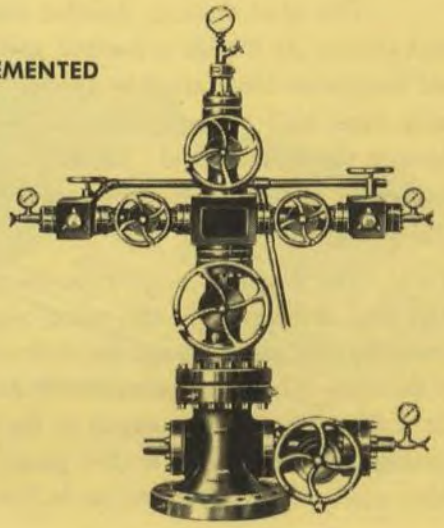
Tool Joints: The drill bit at the bottom of the hole is suspended from the surface by a long series of drill pipes. The pipe is manufactured in 30 foot lengths and is joined together by "tool joints". A joint is a fitting which is threaded so that two lengths of pipe may be joined together. The fittings are either flash-welded or threaded to lengths of pipe.

The tool joint is a critical component of the drilling operation. It must not only connect the drill pipe sections and support many tons of pipe but must also absorb the torque of

PRODUCING WELL







drilling. The rotating action of the table at the top of the wellhead is transmitted through the long, heavy string of pipe which extends down thousands of feet into the earth. As a result, the twisting, grinding action of the operation is transmitted not only to the bit, but also to the tool joints. Continuous wear and tension on these joints makes the string of pipe susceptible to breakage at these points. As a consequence periodic renewal of the tool joints must be made in order to maintain safety of operation. Failure at any one of these joints due to metal fatigue could result in a very expensive fishing operation.

Tool joints are manufactured separately from the casing or steel drill pipe. At present, Canadian production is negligible. Imports amount to approximately half a million dollars per annum and are largely used in refurbishing drill pipe.

The Drill Collar: While the drill pipe weighs many tons, it is buoyed in the drill hole by the drilling mud and by the hole itself. As a result, it is necessary to add weight just above the drill bit. This is accomplished by placing drill collars in the drill string immediately above the bit. A drill collar consists of a hollow shaft of alloy steel weighing from half a ton to two tons.

Imports of drill collars during 1960 amounted to over $700,000. Production in Canada has been limited to custom servicing work. Certain establishments in the West depend to a large extent on the servicing of drill collars. The continuous wear and tear on the drill collar as it turns the bit necessitates the renewal of its thread ends. These are best serviced as close to the wellhead as possible.

At present, it is cheaper to purchase high quality drill collars directly from United States manufacturers. However, the experience and development of the service industry in the West has brought on-the-spot manufacturing of drill collars nearer. It is understood that Canadian producers are investigating the feasibility of producing suitable high quality alloy steel in Eastern Canada in blank form to be trepanned for further machining. The absence of suitable trepanning machinery in Canada has been a definite barrier to the production of drill collars.

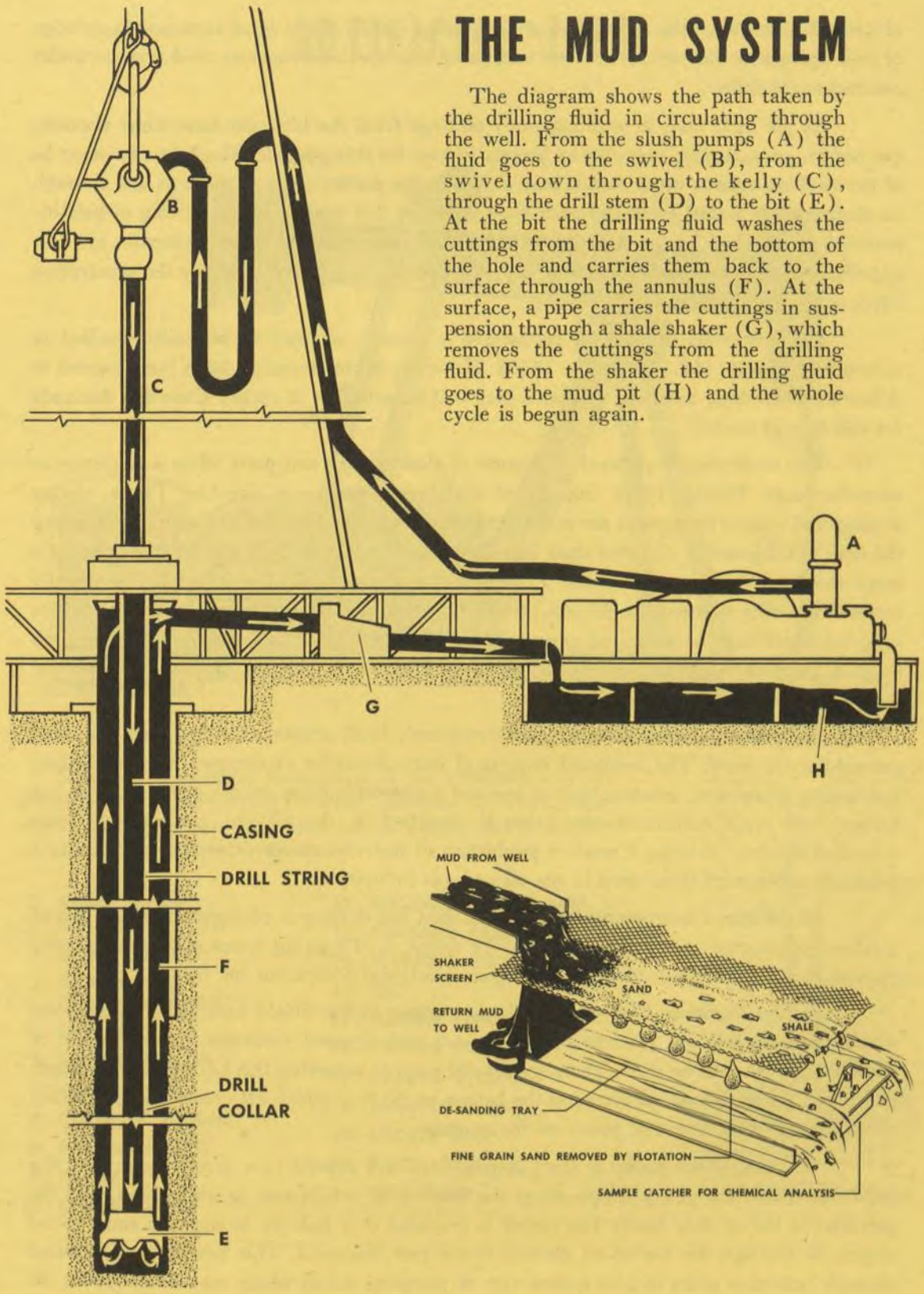
The Mud System: Another important and critical phase of drilling is found in the mud system. As the bit is lowered and continues to cut into the ground it produces cuttings and fragments which must be carried away and discharged from the drilling process. At the same time high temperatures are generated at the bit head, which must be dissipated through the flow of mud. The mud also coats the wall of the hole and thus prevents the seepage of water and foreign gases, reduces friction and gives a certain buoyancy to the drill string.

The mud system starts at the slush pump which picks up the fluid from the suction tank and delivers it to the stand pipe and mud hose swivel. From there it is pumped down the drill pipe through the drill collars and out the bit jets, being forced around the bit in the form of a jet stream under tremendous pressure. The fluid then passes upward around the drill string and is pumped to the surface to a shale shaker or mud screen, where the cuttings are removed. It is then passed through a desander which removes excess sand and other coarser types of sediment. At this stage it re-enters the pumping cycle.

Although this operation may sound simple it involves highly specialized knowledge

THE MUD SYSTEM

The diagram shows the path taken by the drilling fluid in circulating through the well. From the slush pumps (A) the fluid goes to the swivel (B), from the swivel down through the kelly (C), through the drill stem (D) to the bit (E). At the bit the drilling fluid washes the cuttings from the bit and the bottom of the hole and carries them back to the surface through the annulus (F). At the surface, a pipe carries the cuttings in suspension through a shale shaker (G), which removes the cuttings from the drilling fluid. From the shaker the drilling fluid goes to the mud pit (H) and the whole cycle is begun again.



of ground formations, the techniques of drilling operations and a good chemical knowledge of mud operations themselves. It is not surprising that specialists operate mud systems under contract to the driller.

As the fluid used in washing away cuttings from the bit must have some viscosity (or body), ground clay, bentonite or barytes is used for this purpose. The bentonite must be of the swelling type in order that it may penetrate the porous walls of the hole and through its absorption of water, swell and pack these holes. In this manner a thin coating of gelatine material is absorbed by the drill hole itself. Other chemicals and coarse materials are also added as required to pack fissures and rock strata which may be too large for the penetrating effect of the swelling type of bentonite.

Until recently, the lack of production in Canada of swelling bentonite resulted in substantial imports ($2,500,000 in 1959). However, bentonite mines have been located in Alberta. When these are fully operative they will be sufficient to satisfy Canadian demands for this type of mud.

The continuing high level of imports of slush pumps and parts offers a challenge to manufacturers. During 1960, imports of such equipment were sizeable. Tanks, shaker screens and related equipment are manufactured in Canada. The abrasive effect of pumping the mud in conjunction with the shale and sand which it washes from the bit head creates a large market for expendable parts. Pistons, valves, seats and liners must be continually renewed in order to maintain efficient pressures during the drilling operation. Many service establishments have been located close to the drilling fields for this very reason. The high level of imports suggests that further expansion may be made in the manufacture and servicing of such fluid end parts in Canada.

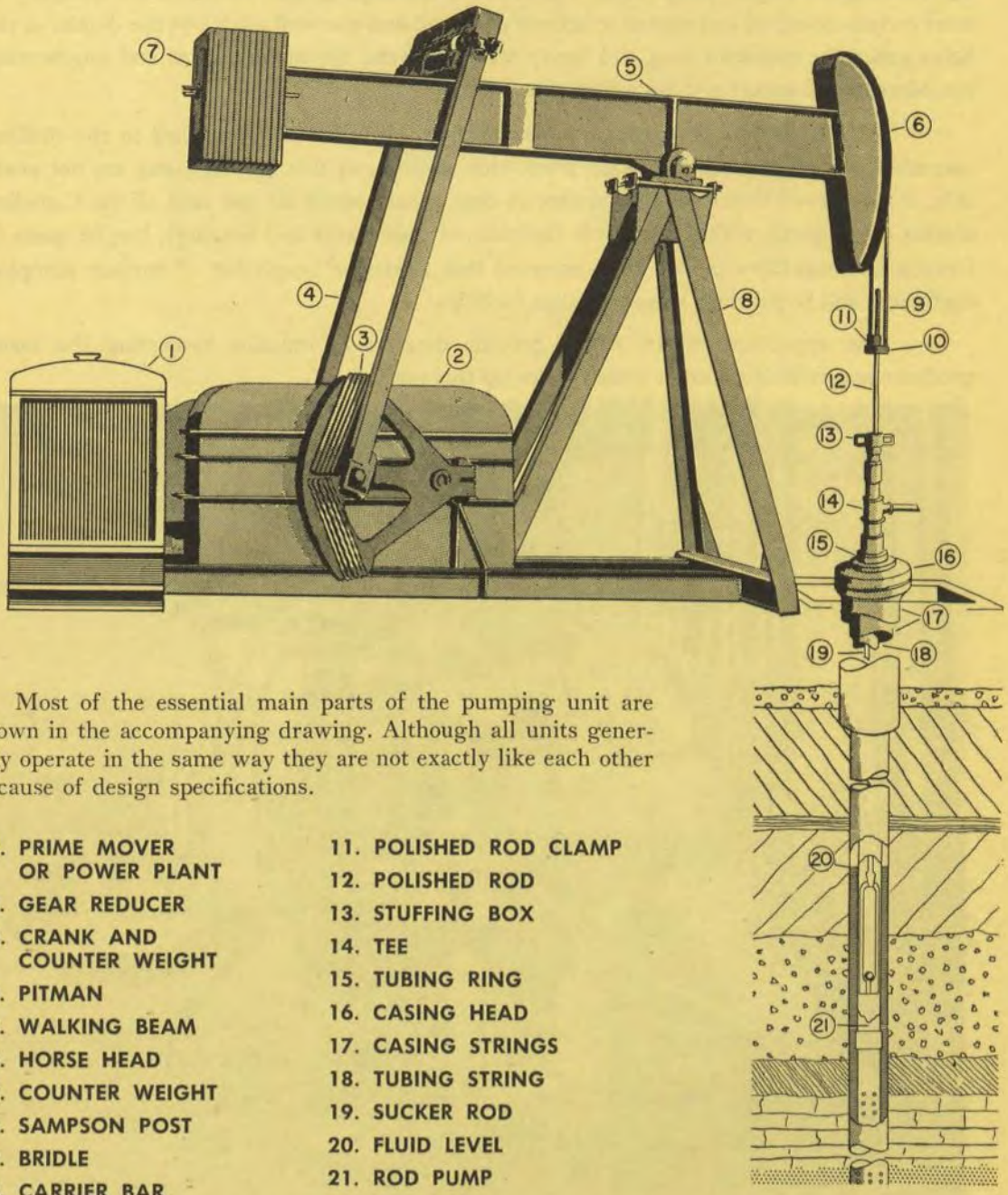
Instruments: Instruments are used extensively in all phases of drilling, and in oil and gas production itself. The combined imports of instruments for exploratory use, for drilling and testing equipment, amount to over one and a quarter million dollars per year. It is not known how much additional production is absorbed by the oil and gas industry from Canadian sources. Existing Canadian production of instruments for other industries bears a great similarity with those used in the oil and gas industry.

As the use of instruments for oil exploration and drilling is confined largely to that of service groups such as seismographic survey teams, well logging teams, and other testing groups, the instruments tend to be packaged as original equipment for them.

Surface Pumping Equipment: When pressures in the oilfield have fallen to the point where the well will not produce under its own underground pressures, some method of stimulating flow must be used. There are several ways of achieving this but the most common is through the use of pumps placed at the bottom of the hole which are connected by a string of sucker rods to a source of power on the surface.

The size of the pump or the pumping unit will depend to a great extent upon the depths at which the pump is operating, the flow of oil which can be anticipated, and the potential of the oil field itself. The power is provided to a jack by means of a small diesel engine or through the use of an electric motor (see diagram). This power is transmitted through reduction gears to give a slow rate of pumping action which may be as low as 20

ARTIFICIAL LIFT



Most of the essential main parts of the pumping unit are shown in the accompanying drawing. Although all units generally operate in the same way they are not exactly like each other because of design specifications.

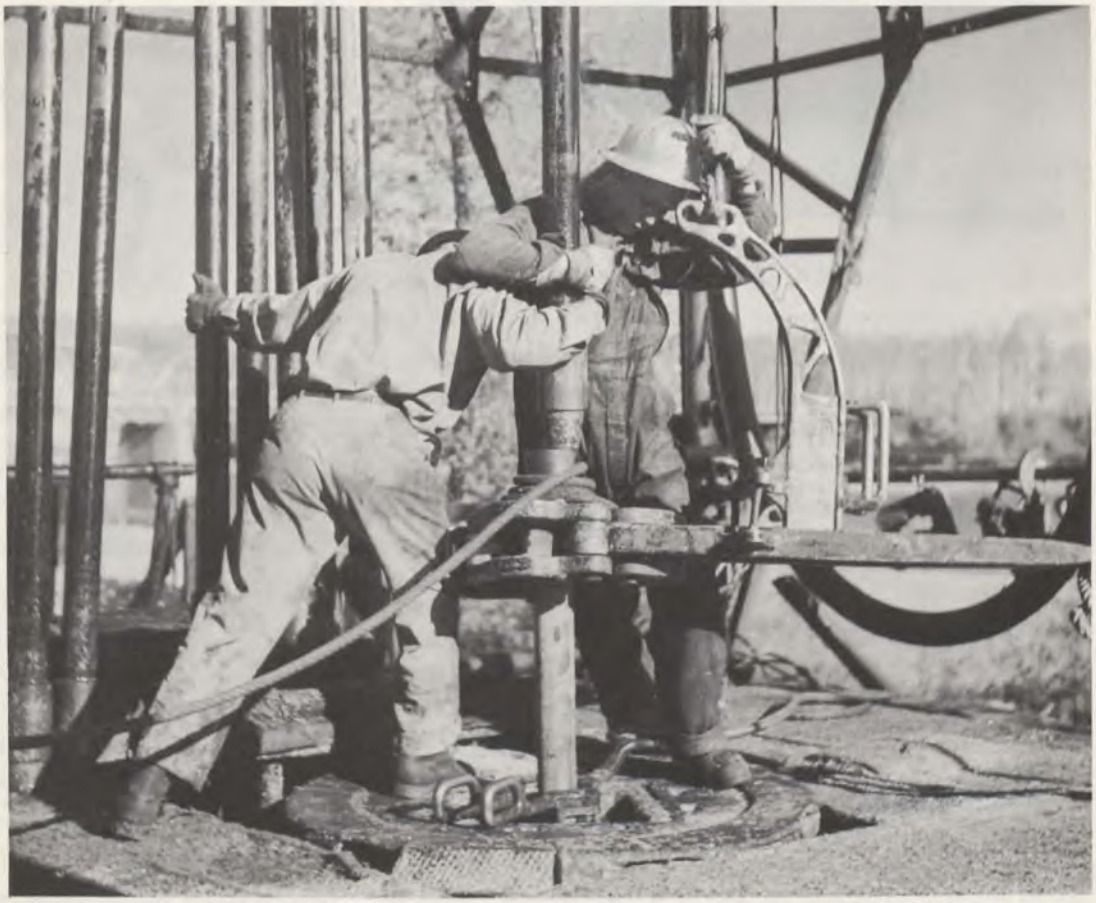
1. PRIME MOVER OR POWER PLANT
2. GEAR REDUCER
3. CRANK AND COUNTER WEIGHT
4. PITMAN
5. WALKING BEAM
6. HORSE HEAD
7. COUNTER WEIGHT
8. SAMPSON POST
9. BRIDLE
10. CARRIER BAR
11. POLISHED ROD CLAMP
12. POLISHED ROD
13. STUFFING BOX
14. TEE
15. TUBING RING
16. CASING HEAD
17. CASING STRINGS
18. TUBING STRING
19. SUCKER ROD
20. FLUID LEVEL
21. ROD PUMP

strokes per minute. This stroking motion in turn is transmitted by the use of sucker rods which activate the pump at the bottom of the well hole. Total imports of commodities used for this function have totalled from two to three million dollars each year.

Sucker rods are made in a variety of sizes usually about 30 feet long; lengths less than 30 feet long are called "pony" rods. The rods are threaded at both ends and are designed to meet certain chemical and corrosive actions of the oil and gas well itself. As the depths of the holes generally require a long and heavy string of rods, the metallurgical and engineering consideration of sucker rod manufacturing are vital.

Surface Pumps: Imports of surface pumps, exclusive of those used in the drilling operation, are substantial. Although production statistics of this type of pump are not available, it is believed that Canadian producers now satisfy about 25 per cent of the Canadian market. Most parts, with the possible exception of gear boxes and bearings, can be made in Canada at competitive prices. It is expected that a greater proportion of surface pumping equipment will be provided from Canadian facilities.

The appendices which follow provide detailed information respecting the many products and individual items which make up this market.



Screwing section of drill stem into column in ground in the Leduc oil fields near Devon, Alberta.

STATISTICAL APPENDICES

TABLE I

IMPORTS OF OIL AND GAS DRILLING EQUIPMENT

	1957	1958	1959	1960
Well drilling machinery and parts (S.C. 5482)	$51,646,521	$37,425,855	$38,304,015	$35,833,542
Oil country goods — steel n.o.p. (S.C. 5185)	n.a.[1]	4,126,667[2]	8,465,810	8,066,661
Drilling mud (Bentonite)[3] (S.C. 7305)				493,105
Total	$51,646,521	$41,552,522	$46,769,825	$44,393,308

1. *No close correspondence with former classes prior to July 1958.*
2. *July to December cumulative total.*
3. *New statistical classification for 1960 — previously with No. 5482.*

Source — *Trade of Canada.*

TABLE II

IMPORTS OF SELECTED TYPES OF OIL AND GAS DRILLING EQUIPMENT

	Drawworks and parts	Power units and parts	Drill Collars and parts	Tool Joints and parts	Drill Bits and parts	Mud and Slush Pumps	Cementing Units	Centralizers
Total for 1960	$565,622	$1,229,988	$703,041	$485,966	$10,883,719	$176,016	$304,858	$ 30,078
January	7,847	167,921	49,931	20,505	1,619,769	26,188	—	1,974
February	56,170	69,078	121,603	74,505	1,373,146	4,298	—	3,999
March	7,129	27,480	42,757	40,075	1,484,969	1,388	49,258	6,074
April	2,726	36,139	24,430	12,037	392,244	2,834	—	4,209
May	60,742	45,013	61,003	46,638	608,121	—	48,985	—
June	24,977	317,316	104,389	57,195	747,774	—	—	—
July	18,304	23,441	61,564	9,383	566,003	6,313	—	—
August	112,767	131,177	33,395	19,126	1,019,153	83,263	48,359	12,128
September	35,456	143,214	29,340	110,418	680,992	25,941	—	—
October	92,846	75,852	87,373	59,262	700,235	—	—	1,694
November	104,536	49,708	63,061	16,439	800,528	25,791	158,256	—
December	42,122	143,649	24,195	20,383	890,785	—	—	—

NOTE: Imports of selected items of shipments valued at $1,000 and over, included in statistical classification 5482.

TABLE II

IMPORTS OF SELECTED TYPES OF OIL AND GAS DRILLING EQUIPMENT cont'd.

	Scratchers	Shoes	Wellhead Assemblies	All Valves and parts	Walking Beams and Crank Pumps	Power Pumps	Storage Tanks	Drilling Rigs
Total for 1960	$56,826	$33,949	$273,656	$1,145,457	$1,695,724	$777,578	$333,044	$846,859
January	1,565	—	14,381	86,514	75,681	48,890	30,886	76,155
February	7,726	—	33,518	125,275	161,600	79,109	49,230	67,193
March	11,785	9,479	51,164	183,968	117,427	39,374	41,415	—
April	2,287	3,879	14,479	88,221	53,494	58,341	73,782	—
May	3,147	3,700	19,557	70,436	181,336	26,733	24,039	139,731
June	3,165	—	11,536	44,335	197,097	179,857	9,248	292,557
July	4,991	1,847	62,328	83,432	137,745	63,368	3,978	236,489
August	8,499	10,784	24,396	97,006	205,317	71,199	34,482	—
September	—	—	12,289	73,742	108,133	145,103	14,340	—
October	6,081	—	13,849	129,529	187,424	19,465	25,269	23,566
November	3,087	4,260	13,934	118,183	163,061	17,222	11,069	11,168
December	4,493	—	2,225	44,816	107,409	28,917	15,306	—

NOTE: Imports of selected items of shipments valued at $1,000 and over, included in statistical classification 5482.

TABLE III

DETAILS OF IMPORTS OF OIL AND GAS DRILLING EQUIPMENT, AUGUST 1960

BASED ON AN EXAMINATION OF INVOICES VALUED AT $1,000 AND OVER

ITEMS:

(1) *Import Class 5482:* Well-drilling machinery and apparatus, and parts, for use in drilling for water, natural gas or oil, or in prospecting for minerals; machinery and apparatus of a class or kind not made in Canada, for maintenance and testing purposes in connection with gas or oil wells; well-packers and parts, for oil or gas wells; materials, not mentioned elsewhere, for the manufacture of the foregoing.

(2) *Import Class 5185:* Oil country goods, steel, n.o.p.

REFERENCES:

(1) Customs Tariff: Items 399a, 410d, 848, 848a, and 848b.

(2) Trade of Canada "Imports" Classes 5482 and 5185.

(3) Composite Catalog of Oil Field Equipment and Services.

ORIGIN OF IMPORTS:

During August, 1960 total imports into Canada under classes 5482 and 5185 were valued at $3,063,901 and $220,833 respectively.

Country	Class 5482 Value ($)	Class 5185 Value ($)
United Kingdom	51,964	22,427
Germany West	1,371	—
Japan	—	66,223
United States	3,010,566	132,183
	$3,063,901	$220,833

Source: Trade of Canada, Imports

SUMMARY:

	Value ($)	Total Value ($)
1. GEOPHYSICAL PROSPECTING EQUIPMENT		29,015
2. DRILLING UNITS:		
Drawworks and parts	112,767	
Drilling Machines and parts	40,161	
Spudders	10,832	163,760
3. DRILLING EQUIPMENT:		
Mast or derrick parts	1,371	
Drilling line and wire line equipment	760	
Blocks, hooks and sheaves	12,767	
Swivel parts	1,472	
Kellys and parts	305	
Rotary tables and parts	3,282	
Rotary hose and other hose	6,968	
Power units and parts	131,177	
Transmission equipment	25,263	
Clutches and parts	2,305	
Hoists and catheads and parts	2,821	
Brake units and parts	3,656	
Other drill rig parts and hydraulic controls	14,626	
Drill pipe equipment	1,667	
Drill collars and parts	33,395	
Tool joints and parts	19,126	
Drill bits and parts	1,019,153	
Other drilling equipment	44,826	
Mud and slush pumps and parts	83,263	
Casing accessories	4,654	1,412,857
4. ANCILLARY DRILLERS' EQUIPMENT:		
Anchors and parts	1,698	
Elevators and parts	2,238	
Fishing and cutting tools	52,025	
Overshots and parts	2,120	
Packers and parts	43,732	
Plugs	1,783	
Slips and parts	4,582	
Spiders and parts	1,022	
Tongs and parts	2,252	
Rotary and casing tong parts	4,014	
Tubing tong parts	1,113	116,579
5. BLOWOUT PREVENTERS AND PARTS		20,069
6. DOWN HOLE — PRESSURE CONTROLLING AND MEASURING DEVICES		22,396
7. CEMENTING EQUIPMENT		109,763

	Value ($)	Total Value ($)
8. PERFORATING EQUIPMENT		17,047
9. WELL LOGGING EQUIPMENT		35,765
10. WELLHEAD COMPLETION EQUIPMENT		112,378
11. FITTINGS		18,290
12. VALVES AND PARTS		85,787
13. PRODUCTION PUMPS AND PARTS:		
Beam and crank pumps and parts	205,317	
Sucker rod accessories	1,910	
Other rods and accessories	394	
Stuffing box parts	53	
Sub-surface pumping equipment	27,220	234,894
14. POWER PUMPS, NOT ELSEWHERE SPECIFIED		71,199
15. WELL SERVICING AND TREATING EQUIPMENT		2,609
16. GAS AND OIL TREATMENT EQUIPMENT		30,239
17. STORAGE TANKS AND PARTS		43,304
18. ELECTRICAL AND ELECTRONIC EQUIPMENT		4,290
19. INSTRUMENTS, GAUGES, INDICATORS, REGULATORS AND EQUIPMENT FOR ANALYSIS		13,422
GRAND TOTAL — Oil Well Drilling Equipment		***$2,543,663***
GRAND TOTAL — Steel Oil Country Goods		***$ 210,490***

Source: Special tabulation of import invoices of $1,000 or more for August, 1960

Detailed descriptions of the articles imported are shown on the following pages.

DETAILS:

IMPORT CLASS 5482

	No.	Value ($)
1. GEOPHYSICAL PROSPECTING EQUIPMENT		
Cables: seismic	50	1,249
Detectors: seismic	450	2,194
Detectors and cable: seismic	12	100
Hydrographic surveying system: electronic (rental)	1	23,206
Magnetic recording heads: seismic	25	2,266
TOTAL GEOPHYSICAL PROSPECTING EQUIPMENT		*$ 29,015*
2. DRILLING UNITS		
DRAWWORKS AND PARTS		
Cantilever mast, 131 feet with accessories	1	18,916
Mast, 50 feet, with accessories	2	11,845
Mast, 55 feet, with accessories	1	7,238
Mast, 96 feet, with drill rig, self-propelled, with rotary drive assembly, engine powered (used)	1	67,392
Housings: drawworks, engine house and windbreak	5	7,376
		$ 112,767
DRILLING MACHINES AND PARTS		
Drill: well, less engine	1	4,378
Oil well, complete, with spare parts	1	23,272
Water well: truck mounted	2	12,511
		$ 40,161
SPUDDERS		
Oil well, with servicing equipment	1	10,832
TOTAL DRILLING UNITS		*$ 163,760*
3. DRILLING EQUIPMENT		
MAST OR DERRICK PARTS		
Poles: gin	1 set	1,320
Turnbuckles	6	51
		$ 1,371
DRILLING LINE AND WIRE LINE EQUIPMENT		
Latches	3	62
Retrievers: line	1	105
Rollers: wire line guide	12	221
Sockets: swivel rope	2	31
Wipers: wire line	8	141
Yokes	9	200
		$ 760
BLOCKS, HOOKS AND SHEAVES		
Blocks: breakout	1	30
Blocks: crown, complete with fastline and sheaves	1	4,651
Blocks: travelling, 250 tons capacity	1	4,655
Centre pin	1	207
Hooks: complete (used)	1	2,450
Sheaves with hub: pump	1	100
Wheels: sheave	2	674
		$ 12,767

	No.	Value ($)
SWIVEL PARTS		
Bearings	4	381
Goosenecks	12	190
Shafts	2	76
Washpipes	43	825
		$ 1,472
KELLYS AND PARTS		
Bushings	4	175
Guides	12	64
Wipers	4	66
		$ 305
ROTARY TABLES AND PARTS		
Main bearing assembly	1	703
Bearing parts	—	2,579
		$ 3,282
ROTARY HOSE AND OTHER HOSE		
rotary hose with couplings		
3" ea. 55 ft.	2	2,704
Cementing and circulating hoses 2" x 5 ft.	10	2,529
		$ 5,233
discharge hose units with couplings		
3½" x 60 ft.	1	1,652
hose parts		
Sleeves: adapter	5	83
		$ 6,968
POWER UNITS AND PARTS		
diesel engine parts		
Bearings	32	30
Belts	30	55
Belt sets	8	65
Crankshafts	1	1,459
Crankshafts (used)	1	2,759
Gears	6	185
Gear assemblies	3	58
Injectors	9	87
Pump assemblies	3	583
Pump kits	4	104
Ring sets	7	124
Rods: connecting	2	134
Shafts	6	35
Springs	295	112
Washers	20	49
Miscellaneous parts	—	552
		$ 6,391
gasoline engines	13	35,396
pumping engines (types unknown)	3	3,023

engine accessories		
Elements: oil filter	1,400	2,343
Generators	2	1,578
		$ 3,921
air compressors: portable	3	4,971
air compressor parts: miscellaneous	—	86
gas compressor parts		
Cylinders	9	72,615
Filters: by-pass oil	3	1,525
Filters: full flow oil	3	1,539
Silencers	3	1,710
		$ 77,389
		$ 131,177
TRANSMISSION EQUIPMENT		
Compounding transmission: complete for installation on Rig	1	11,655
Transmission assembly: single engine	1	1,065
		$ 12,720
sprockets		
Sprockets: drive	1	180
drive chain		
Steel roller chain: detachable	910 ft.	5,382
Steel roller chain: detachable	—	3,848
Steel roller chain	304 ft.	3,016
Chain offset links	28	117
		$ 12,363
		$ 25,263
CLUTCHES AND PARTS		
Clutches: centrifugal, for automatic drillers (on lease)	2	327
Clutches: gear tooth	1	140
clutch parts		
Hubs: idler	1	28
Plates: breakout clutch	1	62
Plates: centre	3	157
Plates: friction	1	181
Shafts	11	150
Spiders	6	131
Spiders: clutch drum	1	1,129
		$ 1,838
		$ 2,305
HOISTS AND CATHEADS AND PARTS		
Breakout cathead with air controls	1	986
Hoist parts: flanges	2	1,586
Cathead parts: miscellaneous	—	249
		$ 2,821

BRAKE UNITS AND PARTS	No.	Value ($)
Brakes: hydromatic (used)	1	2,205
brake parts		
Cams	5	29
blocks		
Metallic	36	253
Non-metallic	70	655
Plugs	1,000	89
Rims	1	284
Screws: brass flat head with hex nuts	504	57
Miscellaneous parts	—	84
		$ 1,422
		$ 3,656
OTHER DRILL RIG PARTS AND HYDRAULIC CONTROLS		
drill rig parts		
Controls: weight	2	6,825
Flanges	2	1,612
Housings: bearing	1	203
"O" rings	300	137
Retainers	1	90
Rig lighting: vapor proof	1	1,027
Seals: grease	24	978
Shims	47	22
Spacers	6	48
Spool: sandreel drum	1	1,291
		$ 12,233
hydraulic controls		
Bushings: thrust	8	104
Gaskets: packing	8	40
Half nuts	32	604
Joints: universal	8	340
Locknuts: piston	4	82
"O" rings: cylinder	36	81
Packings: ram shaft	56	89
Rings: packing adapter	8	101
Rings: scraper	25	130
Shafts: locking	4	499
Miscellaneous parts	—	323
		$ 2,393
		$ 14,626
DRILL PIPE EQUIPMENT		
Protectors	210	1,236
Wipers	26	431
		$ 1,667
DRILL COLLARS AND PARTS		
Drill collars 4⅜" O.D.	4	5,324
6¾" O.D.	15	10,658
7"	20	15,301
		$ 31,283

		No.	Value ($)
drill collar parts			
Shock absorber tool, for drill collar string		1	1,698
Subs		1	414
			$ 2,112
			$ 33,395
TOOL JOINTS AND PARTS			
Tool joints		119	9,602
Tool joints: internal flush type		103	6,795
			$ 16,397
tool joint parts			
Boxes		63	2,496
Protectors: thread		103 sets	233
			$ 2,729
			$ 19,126
DRILL BITS AND PARTS			
cutterheads with core catchers			
Locking bowls		5	35
Nozzles: jet		204	553
Plates: breakout		6	2,233
			$ 2,821
diamond core bits and parts			
	Size		
Diamond drill bits	—	5	14,227
	6⅛"	1	3,337
	6⅛" x 3½"	4	9,131
	6⅝"	1	3,634
	6⅝" x 3½"	3	4,659
	7¾" x 3½"	1	3,464
	8 17/32"	1	6,289
	8 9/16"	1	3,392
Core catchers		14	449
Couplings: core barrel		1	117
			$ 48,699
finger bits			
Size			
4½"		—	333
5⅝"		—	601
6¾"		6	162
			$ 1,096
insert bits			
Size			
3 7/16"		—	1,502
4¼"		—	2,563
4½"		—	9,273
Carbide insert blade bits	4¼"	60	1,006
	4½"	60	1,006
Rock cutter bit blades		48 sets	643
			$ 15,993

rotary rock bits (regular type)

Size	Cone	No.	Value ($)
3⅞"	3	306	9,336
4¼"	2	378	9,490
4¼"	3	736	21,709
4½"	2	336	8,479
4½"	3	1,786	52,556
4¾"	3	91	3,108
5⅝"	3	4	413
5⅞"	3	3	335
6"	3	7	820
6⅛"	3	47	5,465
6¼"	3	260	29,929
6¾"	3	28	3,763
7⅜"	3	7	1,000
7⅝"	3	8	1,139
7⅞"	3	1,078	156,407
8⅜"	3	15	2,465
8½"	3	7	1,111
8⅝"	3	223	35,296
8¾"	2	9	1,437
8¾"	3	974	162,071
9"	3	606	100,904
9⅞"	3	61	11,226
11"	3	1	206
12¼"	3	62	17,678
13¾"	3	14	4,486
15"	3	5	2,100
			$ 642,929

rotary rock bits (regular type)

Size	Cone and Quantity not indicated	Value ($)
3⅞"		5,239
4¼"		6,566
4½"		23,952
4¾"		3,916
		$ 39,673

rotary rock bits (jet type)

Size	Cone	Jet Size	No.	Value ($)
7⅞"	3	—	96	19,263
8⅜"	3	—	57	18,526
8⅝"	3	—	39	15,321
8¾"	3	—	496	107,665
8¾"	3	3/8"	1	241
8¾"	3	1/2"	13	3,071
8¾"	3	9/16"	12	1,995
8¾" repaired	3	—	3	2,312
9"	3	—	132	36,677
9"	3	7/16"	10	2,391
9"	3	1/2"	17	4,065
9"	3	9/16"	20	4,957

rotary rock bits (jet type) Cont'd

Size	Cone	Jet size	No.	Value ($)
9″	3	11/16″	5	1,195
9 3/8″	3	—	10	2,274
9 7/8″	3	—	57	12,778
9 7/8″	3	7/16″	4	1,070
12 1/4″	3	—	34	10,665
				$ 244,466

rotary rock bits (piloted reaming)

Size	Cone	No.	Value ($)
15″	3	2	1,024
17 1/2″	3	12	13,773
26″	4	1	2,646
Piloted reaming bit bodies		3	1,588
			$ 19,031

rotary rock bits (quantity, type, no. of cones not indicated)

Size	Value ($)
3 1/4″	1,693
5 5/8″	813
	$ 2,506

other drill bits and parts (type not indicated)

Size	No.	Value ($)
7″	7	190
8″	2	359
—	56	1,317
Bit shanks	5	73
		$ 1,939
		$1,019,153

OTHER DRILLING EQUIPMENT	No.	Value ($)
Breakers: bit	21	531
Chains: spinning	10	221
Drillers: automatic (on loan)	2	792
Drillers: bottom hole, hydraulic	1	3,626
Drive bodies	—	842
Guides: sleeve	21	372
Joints: safety	3	989
Joints: safety bumper	8	17,023
Mandrels: disc spring	2	69
Nuts: shear	42	170
Pistons: packer	—	253
Rathole drilling unit: complete	1	12,253
Rubber elements: open hole	99	4,539
Screws: shear	1,302	405
Sleeves: adapter	7	93
Spears: trip	1	1,638
Spiders: bit	10	49
Springs: trip	2	503
Subs	1	68

OTHER DRILLING EQUIPMENT Cont'd	No.	Value ($)
Subs: nozzle	1	270
Subs: releasing	6	120
		$ 44,826
MUD AND SLUSH PUMPS AND PARTS		
Slush pump, complete with air chamber and accessories	1	17,969
parts		
Air chamber	1	538
Air chamber screens	1	29
Baffles: fluid	2	56
Bearings	6	146
Bodies: piston	8	70
Bodies: valve	1	121
Bolts: retainer	18	46
Boxes: stuffing	4	698
Boxes: fluid stuffing	3	466
Bumper assemblies	10	92
Bushings	21	417
Bushings: solid gland	4	74
Bushings: stuffing box	35	659
Crosshead body sleeves	14	309
Crosshead extensions	2	201
Crosshead rings	6	132
Crosshead shoes	2	26
Cylinder assemblies	3	1,827
Cylinder: fluid, complete with studs, valve cover plates and cylinder heads	1	5,606
Fluid end	1	563
Fluid end assembly	1	4,376
Gaskets	197	141
Gaskets: stuffing box	4	98
Gaskets: valve cap	510	830
Gaskets: valve cover	120	147
Glands	6	333
Glands: stuffing box	25	894
Guides: valve	41	254
Inserts: valve	322	1,637
Liner lock bolts with nuts	10	232
Liners	113	13,582
Links: connecting	80	177
Packings	85 sets	308
Packings: fluid piston rod	52 sets	914
Packings: gland	356	2,009
Packings: liner	376	1,228
Packing assemblies: liner	12 sets	344
Packings: rod	24	343
Packings: stuffing box	4	78
Packings: swivel washpipe	4	73
Packings: valve cover plate	48	49

parts cont'd.	No.	Value ($)
Packings: washpipe	51 sets	507
Pistons	153	4,164
Plungers	30	1,472
Retainers: valve	8	35
Rings	24	72
Rings: float	6	56
Rings: junk	58	288
Rings: lantern	4	99
"O" rings	72	57
Rings: seal	48	146
Rings: snap	36	53
Rods: connecting	4	134
Rods: piston	80	2,688
Rubbers: piston	381	7,525
Seals	10	90
Seals: liner	232	1,084
Seals: plunger	23	42
Seats: valve	90	1,341
Set screws: liner	8	90
Sirens	34	252
Sleeves: liner	20	74
Sleeves: liner rubber	12	50
Spacers	3	32
Springs: valve	40	48
Sprockets	9	389
Strainers	1	40
Studs	36	115
Studs: valve cap	13	68
Studs: valve cover with hex nuts	18	49
Valve assemblies	6	368
Valves: complete	106	2,461
Washers: stuffing box	36	107
Washpipes	5	290
Miscellaneous parts	—	885
		$ 65,294
		$ 83,263
CASING ACCESSORIES		
Anchor clamp set	1	47
Blocks: blade, casing scraper	12	190
Heads: drive, male drop	1	260
Protectors	607	4,157
		$ 4,654
TOTAL DRILLING EQUIPMENT		*$1,412,857*

4. ANCILLARY DRILLERS' EQUIPMENT

	No.	Value ($)
ANCHORS AND PARTS		
Anchors	10	1,086
Anchors: hydraulic hold down	2	612
		$ 1,698
ELEVATORS AND PARTS		
Casing, side door, extra heavy (repaired)	1	187
Casing: type unknown	6	1,394
parts		
Hooks	1	72
Latches	2	86
Shanks (as hook parts)	1	332
Miscellaneous	—	167
		$ 2,238
FISHING AND CUTTING TOOLS		
Boots: cushion stabilizer	4	481
Bowls	2	495
Bushings	4	291
Bushings: reamer	275	3,753
Cable: size 5/16"	14,000 ft.	2,988
Capscrews	180	40
Controls: grapple	5	70
Cutters: jet casing	30	1,034
Grapples: basket	14	1,221
Grapples: spiral	8	517
Guides: cut lipped	1	62
Guides: flush	1	42
Jars	3	1,005
Jars: hydraulic	10	14,586
Jars: rotary up and down	1	1,632
Jars: tubular	1	54
Joints: safety, jar	2	3,677
Mandrels: jar	2	635
Mandrels: trip	2	326
Middle body: with piston and piston rings	3	1,487
Packers: basket control	5	181
Packers: basket mill control	3	181
Packing sets (for jar safety joints)	100	1,431
Plates: lock for reamers	200	244
Reamers	10	224
Reamer cutters	35	3,445
Reamers: 3 point complete with cutters	1	776
Reamers: rotary	5	5,390
Rings: piston	23	105
Rings: trip	2	190
Ring sets: packing	12	116
Seals: inner	42	131
Shoes: milling	3	533
Spears	2	82

FISHING AND CUTTING TOOLS Cont'd	No.	Value ($)
Spears: trip	1	1,715
Spring assemblies: disc	3	766
Springs: trip	3	479
Unions: lubricator	3	234
Miscellaneous cutting and fishing tool parts	—	1,406
		$ 52,025
OVERSHOTS AND PARTS		
Overshots	2	113
Overshots: releasing and circulating	3	1,668
Bowls	1	171
Packers	5	43
Washpipes	1	125
		$ 2,120
PACKERS AND PARTS		
Packers	13	3,349
Packers: anchor	4	433
Packers: bottom hole	15	1,458
Packers: formation	1	907
Packers: hook wall	9	2,324
Packers: hydraulic set retrievable	12	7,520
Packers: production	11	4,446
Packers: retainer production	11	2,739
Packers: retriever	1	336
Packers: squeeze	4	428
Packers: treating	11	1,567
Packer sampler assembly	1	2,654
parts		
Barrels: sampler	15	861
Collars: travel	44	3,195
Heads: sliding	50	3,750
Inserts: slip	47	178
Pads: slip	42	34
Rings: split	50	3,971
Rubbers	63	1,441
Sealing units: standard	4	707
Shear nuts	12	48
Shoes: packer	2	55
Slips	43	559
Springs	24	61
Supports: packer	10	244
Valves	7	180
Valve seats	6	176
Miscellaneous	—	111
		$ 43,732
PLUGS		
Plugs: bridge	13	1,783

	No.	Value ($)
SLIPS AND PARTS		
Buttons: converting for rotary slips	288	323
Carriers: slip	15	340
Dogs: latch	12 sets	173
Dogs for slips	15 sets	900
Inserts: slip	28	105
Rings: casing slip	3	153
Slips: casing	3	271
Slips: drill collar	2 sets	426
Slips: drill pipe	6 sets	1,261
Slips with dogs	1	212
Miscellaneous parts	—	418
		$ 4,582
SPIDERS AND PARTS		
Slips	1 set	64
Slip bowls	1	92
Spiders (no further identification)	2	653
Miscellaneous	—	213
		$ 1,022
TONGS AND PARTS		
Tubing tong: hydraulic power geared	1	2,252
ROTARY AND CASING TONG PARTS		
Guides: latch	12	55
Latch lug jaw	1	128
Lever	1	191
Springs: pull back	60	337
Tong dies	5,202	3,269
Miscellaneous parts	—	34
		$ 4,014
TUBING TONG PARTS		
Bushing assemblies	4	226
Idler roller bearings	12	74
Jaw assemblies	14	360
Positioning valve assemblies	6	248
Miscellaneous parts	—	205
		$ 1,113
TOTAL ANCILLARY DRILLERS' EQUIPMENT		*$ 116,579*
5. BLOWOUT PREVENTERS AND PARTS		
CASING HEAD CONTROLS		
Casing head control manifold with accessories	1	1,350
OTHER BLOWOUT PREVENTERS		
Combination rotating blowout preventers and strippers, complete (on loan)	1	3,558
PARTS FOR BLOWOUT PREVENTERS		
Chambers: 20 gallon surge	4	3,533
Connectors: plunger	1	36
Diaphragms	2	237

PARTS FOR BLOWOUT PREVENTERS Cont'd	No.	Value ($)
Gaskets: head	3	48
Handles: operating	2	118
Operators: manual	2	1,210
Packing elements: ram	6	220
Packing units: rubber	8	4,520
Ram assemblies	12	2,081
Rings: gasket	4	38
Rings: seal	118	735
Screws: locking	4	251
Stabilizers: diaphragm	2	44
Strippers: tubing	9	468
Studs and nuts	24 sets	91
Valves	3	40
Miscellaneous parts	—	124
		$ 13,794
PULSATION DAMPENER PARTS		
Actuating cylinder assemblies	2	442
Handles	6	84
Hinge brackets	4	80
Plunger and cylinder assemblies	1	387
Valves: regulating	1	301
Miscellaneous parts	—	73
		$ 1,367
TOTAL BLOWOUT PREVENTERS AND PARTS		*$ 20,069*
6. DOWN HOLE — PRESSURE CONTROLLING AND MEASURING DEVICES		
DOWN HOLE PRESSURE CONTROL DEVICES		
Cups: choke	46	59
Mandrel assemblies	5	560
Mandrels: locking	4	397
Mandrels: packing	2	90
Nipples: landing	17	986
Pulling tool dogs	14	235
Rings: packing	286	160
Rubbers: line	30	110
Running tools	—	58
Sliding side doors	2	445
Springs	218	83
Stops: collar	23	565
Valve assemblies: equalizing	1	55
Miscellaneous parts	—	47
		$ 3,850
DOWN HOLE FORMATION PRESSURE MEASURING DEVICES		
Calipers: tubing and casing (used)	1	1,601
Carriers: recorder	6	1,354

DOWN HOLE FORMATION PRESSURE MEASURING DEVICES Cont'd	No.	Value ($)
Cushions	2	26
Mandrels: gas lift	7	178
Mandrels: lower	2	55
Mandrels: pad contact tools	2	1,940
Mandrels: safety joint	1	67
Mandrels: shut-in tools	51	2,742
Recorders with clock	3	1,137
Recorders: temperature	1	1,189
Retainers: "C"	1	27
Shut-in tools	10	5,692
		$ 16,008
PRESSURE RECORDING AND CONTROLLING		
Recorders: pressure	1	1,481
SUB-SURFACE PRESSURE GAUGE PARTS		
Bellows assemblies	10	311
Charts	1,500	204
Elements: pressure	1	291
Housing assemblies	2	163
Miscellaneous parts	—	88
		$ 1,057
TOTAL DOWN HOLE — PRESSURE CONTROLLING AND MEASURING DEVICES		$ 22,396
7. CEMENTING EQUIPMENT		
Cementing units: with pump and engine, skid mounted	2	48,359
Bands: wall scratcher	125	48
Baskets: bridging	3	255
Bottoms: chisel (sand pump)	16	194
Bottoms: flat (sand pump)	4	28
Bristles: wall scratcher	1,440	753
Cementers: multi-stage	4	1,163
Centralizers: casing	160 sets	3,414
Centralizers: casing	692	8,714
Clamps: lock	1,417	2,072
Collars: baffle	18	1,425
Collars: differential fill-up	2	276
Collars: float	153	8,287
Collars: stop	120	241
Elements: packing	12	178
Fill-up attachments: float collar	14	287
Fill-up attachments: float shoe	6	123
Head assemblies	6	4,725
Hinges: centralizer	300	111
Jets: mixer	18	128
Mandrels: anchor tool	2	145
Openers: side door (sand pump)	4	148
Packer: squeeze	1	115
Plugs: top	48	410

CEMENTING cont'd.

	No.	Value ($)
Pumps: sand	4	1,322
Retainers: cement	26	3,746
Retainers: valve guide bushing	12	108
Rings "O"	212	30
Rings: stop	180	293
Rod and cap: cementer	1	80
Rubbers: wall scratcher	10	448
Scratchers: wall	1,611	8,113
Scratchers: rotating wall	150	386
Shoes: fill-up	2	119
Shoes: float	112	4,958
Shoe: formation packer	1	236
Shoes: guide	137	5,471
Sleeves: setting	2	66
Springs: cement basket	500	217
Tool assemblies: setting (complete)	1	346
Valves: insert	37	542
Valves and stops (sand pump)	4	182
Miscellaneous cementing equipment and parts	—	1,501
TOTAL CEMENTING EQUIPMENT		*$ 109,763*

8. PERFORATING EQUIPMENT

PARTS AND ACCESSORIES

Cartridges	14	8,347
Charges	10	1,329
Detectors	2	3,292
Detectors (repaired)	1	630
Housings	10	1,320
Locators: casing collar	1	240
Panels	2	1,784
Subs: extension	10	105
TOTAL PERFORATING EQUIPMENT		*$ 17,047*

9. WELL LOGGING EQUIPMENT

COMPLETE UNIT (TRUCK MOUNTED), equipped with set of well logging instruments, mounted in cab and power pole hydraulic derrick	1	16,618

OTHER UNITS

Counters: gamma	1	1,463
Logging: radioactivity	1	1,043
		$ 2,506

PARTS AND ACCESSORIES

Calipers: contact	15	192
Centralizers	1	98
Charts	3,000	104
Clocks: pressure recorder	1	310
Compass units	6	648

PARTS AND ACCESSORIES Cont'd

	No.	Value ($)
Connectors	10	44
Counters: measuring device	10	370
Counters: neutron	3	1,482
Dipmeters	1	1,705
Extensions: cable clamp	6	39
Frames: directional surveying instrument	5	501
Gamma crystals	1	195
Glands	18	27
Inclinometers	11	689
Lines: measuring	104,490 ft.	5,481
Magazines: directional surveying instruments	1	67
Measuring devices: not identified	2	612
Meters: flow	1	392
Panels: flowmeter	1	490
Pulleys: measuring devices	3	96
Reel assemblies: measuring line	1	120
Rings: snap	24	218
Testers: mud	1	549
Miscellaneous parts	—	2,212
		$ 16,641
TOTAL WELL LOGGING EQUIPMENT		*$ 35,765*

10. WELLHEAD COMPLETION EQUIPMENT

CHRISTMAS TREES

complete with valves and flange

Casing	Tubing	Testing	No.	Value ($)
7"	2⅜"	2,000 lb.	1	2,025
8"	2"	4,000 lb.	4	3,671
10"	4½"	4,000 lb.	1	1,055
10"	2"	—	1	1,580
—	2"	4,000 lb.	10	9,378
—	—	—	7	6,687
				$ 24,396

CASING HEADS AND PARTS

Bit pilots	16	336
Bodies	13	2,885
Caps	1	27
Casing and tubing head, assemblies	4	1,224
Flanges	23	3,911
Hangers	25	3,034
Heads: casing	34	3,874
Heads: casing, slip on	20	3,591
Heads: casing, with hangers	6	1,953
Heads: casing, with outlets	30	4,658
Packoff assemblies	9	868
Patches: casing	1	528
Seal assemblies	30	1,410

CASING HEADS AND PARTS Cont'd	No.	Value ($)
Slips	39	2,147
Slip and seal assemblies	28	3,813
Spools	6	1,743
		$ 36,002
TUBING HEADS AND PARTS		
Adapters	33	1,878
Adapters: flanged	23	1,702
Bodies	29	4,617
Bonnets	5	410
Bonnets: flanged, with crown and suspension, complete	1	409
Caps: top	8	328
Clamps	15 sets	234
Flanges	12	805
Hangers	82	3,949
Heads: tubing	5	1,754
Heads: tubing, with outlets	29	5,387
Hubs: threaded	15	179
Mandrels	1	508
Rings: packoff	6	226
Spools	34	10,118
Studs and nuts	—	1,468
Tubes: flow	1	81
		$ 34,053
FLOW CONTROLS AND PARTS		
Bodies: choke	4	96
Bonnet assemblies: adjustable choke	4	268
Cages: bean	6	70
Chokes: adjustable	27	2,699
Flow beans	31	202
Flow controls	9	1,915
Flow control assemblies: adjustable	2	402
Orifices: adjustable choke	6	114
Seats: adjustable, choke	5	41
Stems: choke	10	200
		$ 6,007
PARTS FOR WELLHEAD COMPLETION UNITS		
Adapters	2	87
Adapters: bottom hole test	13	787
Bushings: casing head	2	245
Bushings: tubing head	13	515
Dummies	2	520
Gaskets: ring	274	1,378
Lock assemblies	4	811
Mandrels: permanent type	12	4,973
Packings	167	1,591
Plugs: blanking	1	345
Plugs: valve removal	8	124
Rings: junk for casing head	6	25

PARTS FOR WELL HEAD COMPLETION UNITS Cont'd	No.	Value ($)
Rings: rubber, tubing head	2 sets	30
Rings: seal	23	147
Rings: welding	21	736
Rubbers: stripper	6	194
Sleeves: sliding	2	637
Spiders	1	30
Subs: lock	3	51
		$ 13,226
TOTAL WELLHEAD COMPLETION EQUIPMENT		*$ 112,378*
11. FITTINGS		
COUPLINGS		
Adapter	9	146
Casing	1	98
Flow	3	90
Sub	21	224
		$ 558
coupling parts		
Crosses	10	1,040
Discs	7	99
Ells	2	17
Flanges: companion	120	1,579
Flanges: unidentified	6	81
Joints: swivel	8	2,300
		$ 5,116
NIPPLES		
Belled	1	20
Cage	26	203
Casing	7	94
Perforated	11	171
Swaging	24	288
Swaging: standard	24	273
Swaging: extra heavy	21	150
Tubing	156	753
Valve reinstallation	5	122
Unidentified nipples	48	688
Plugs: bull	57	379
Plugs: bull standard	6	35
Plugs: bull double extra heavy	5	50
Plugs: flowline	42	199
Tees	21	378
Tees: flow	27	1,100
Tees: with blanking plugs	26	1,110
Tees: special	4	515
Tees: studded	8	1,003
Unions	289	3,508
Miscellaneous fittings	—	1,577
		$ 12,616
TOTAL FITTINGS		*$ 18,290*

12. VALVES AND PARTS

CHECK VALVES			
Size	Test	No.	Value ($)
2"	10,000 lb.	6	290
2⅜"	10,000 lb.	4	383
No size given		1	267
			$ 940

GATE VALVES AND PARTS			
Size	Test		
¾"	—	200	551
1½"	—	2	154
2"	—	306	8,368
2"	— flanged end	30	7,794
2"	— screwed end	68	2,699
2"	2,000 lb.	3	574
2"	2,000 lb. flanged	4	739
2"	2,000 lb. screwed end	7	1,076
2"	2,000 lb. with handwheel	22	3,205
2"	3,000 lb.	9	774
2"	3,000 lb. flanged	2	205
2"	4,000 lb. flanged	14	2,460
2"	4,000 lb. screwed end	3	458
2"	6,000 lb. flanged	9	1,261
2"	10,000 lb. flanged	9	1,838
2⅜"	— screwed end	6	1,024
2½"	2,000 lb.	2	472
2½"	10,000 flanged	2	940
2½"	2,000 lb. with handwheel	7	1,301
2½"	3,000 lb. with handwheel	3	886
3"	— flanged	6	1,235
3"	1,200 lb. with handwheel	14	2,393
3"	2,000 lb. screwed end	7	1,508
3"	3,000 lb. screwed end	6	1,312
3"	4,000 lb. flanged	2	518
3"	4,000 lb. screwed end	3	684
3"	10,000 lb.	9	2,302
4"	1,200 lb.	6	1,878
4"	5,000 lb.	1	350
6"	2,000 lb. screwed end	5	2,928
Gate and seat assemblies		3	405
Gate and seat assemblies with special side plates		9	2,937
			$ 55,224

MUD VALES AND PARTS			
Size	Test		
2"	2,000 lb.	52	485
4"	2,000 lb.	22	347
5"	2,000 lb. with handwheel	2	1,081
Stem nuts		4	81
Stem packings		32	38
Wear rings		38	73
			$ 2,105

NEEDLE VALVES

Size	No.	Value ($)
½"	264	1,066
½" Angle	26	145
½" Pressure gauge	22	110
½" Straight	24	133
		$ 1,454

PLUG VALVES AND PARTS

Size			
2"		16	2,829
2" flanged ends		31	1,114
3"		100	8,414
3" flanged ends		75	3,096
3" screwed ends		60	5,156
4"		1	61
Seat and plug assemblies		5	472
			$ 21,142

OTHER VALVES AND PARTS

Size	Test		
1"	2,000 lb.	2	171
2"	—	1	66
4½"	—	36	313
— Float valves		6	172
— Gas lift valves		2	1,093
— Relief valves		1	20
2" Shear relief valves		1	92
Valve assemblies		7	634
Miscellaneous valves		30	677
valve parts			
Bodies		48	430
Handles		30	161
Inserts: seat		24	104
Inserts: valve		200	61
Inserts: valve seal		36	34
Keepers		6	21
Pinions		2	30
Rubbers		24	24
Seats		57	503
Stems		10	48
Tops		36	60
Miscellaneous		44	208
			$ 4,922

TOTAL VALVES AND PARTS *$ 85,787*

13. PRODUCTION PUMPS AND PARTS

WALKING BEAM WITH ADJUSTABLE CRANK

48" stroke	6	15,616
54" stroke	24	70,194
64" stroke	3	11,791

WALKING BEAM WITH ADJUSTABLE CRANK Cont'd	No.	Value ($)
84" stroke	2	13,052
86" stroke	2	10,844
96" stroke	1	7,131
100" stroke	1	6,759
Stroke unknown	12	44,139
		$ 179,526
parts for above		
Base extensions	6	800
Bearing assemblies	7	1,008
Brackets: evener centre	4	152
Clamp and U-bolt: lower flange	2 sets	95
Counterweights: crank	36	3,480
Covers: belt	8	569
Evener bearing assembly	1	441
Extensions: multi-cylinder engine	4	1,638
Gear boxes	4	5,709
Ground lubricating systems	5	84
Guards: belt	9	1,136
Hanger assembly: wire line	1	59
Hose: lubricating	6	20
Mulehead cables with hangers	2	81
Pitmans	6	678
Power assemblies for electric motor	3	647
Rail assemblies: slide	8	312
Samson post (derrick type)	1	182
Skid extensions	6	326
Washers	16	10
Weights: auxiliary	20	567
Weights: inner crank	4 sets	1,128
Weights: insert	16	361
Weights: main crank	16	1,113
Weights: wing	8 sets	4,733
Wrist pin assemblies	3	380
Miscellaneous parts	6	82
		$ 25,791
		$ 205,317
SUCKER ROD ASSEMBLIES		
Rotators: rod	8	690
Scrapers	1,200	1,199
Wipers: sucker rod	4	21
		$ 1,910
OTHER RODS AND ACCESSORIES		
Clamps for 1¼" polished rods	40	394
STUFFING BOX PARTS		
Packing	4	53
SUB-SURFACE PUMPING EQUIPMENT		
Pumps: insert	10	3,383

parts and equipment	No.	Value ($)
Adapters	94	389
Anchors: insert pump	5	335
Balls and seats	363	2,280
Barrels	17	930
Barrels: lock packing	2	62
Bodies	47	240
Bushings	115	577
Cages	203	1,990
Cages: liner	1	59
Caps	22	62
Clamps	25	270
Collars	4	20
Connectors	6	88
Couplings	102	847
Cups	30	15
Cutters: sand line	2	780
Elements	171	615
Glands	15	59
Guides	40	421
Hold downs	16	356
Jackets	2	41
Liners	129	1,162
Locks: "O" subs	6	101
Nipples	40	304
Nuts	97	148
Packings	348	1,458
Plugs	49	371
Plugs: blanking	1	341
Plungers	142	3,517
Retainers	32	65
Rings	230	175
Rods	29	712
Rods: valve	10	84
Shoes	15	261
Sleeves	13	84
Slip assembly	3	120
Spacers	155	190
Tubes	73	1,347
Tubes: barrel	43	2,280
Valves: blanking	2	520
Miscellaneous parts	25	161
		$ 23,837
Total — Sub-surface pumping equipment		$ 27,220
TOTAL PRODUCTION PUMPS, PARTS AND ACCESSORIES		$ 234,894

14. POWER PUMPS, NOT ELSEWHERE SPECIFIED

	No.	Value ($)
WELL FLOODING (WATER) PUMPS		
Pumps: triplex complete	1	5,953
Vertical turbine pump with 10 h.p. motor	1	1,912
		$ 7,865
OTHER PUMP UNITS		
Pumps: fuel	4	66
Pumps: multistage centrifugal complete with auxiliary equipment	1	20,089
Pumps: not identified	2	4,724
		$ 24,879
parts for pumps		
Bearings	4	40
Belt guard	1	119
Boxes: stuffing	16	580
Cup assemblies: dual seal piston	22	470
Diaphragms	2	206
Gaskets	1,008	1,613
Glands	15	84
Impellers: centrifugal pump	1	47
Liners	2	209
Liners with glands	18	700
Lubricator and drive assembly: stuffing box	1	162
Motors (for centrifugal pump)	2	7,522
Nuts: stuffing box	15	147
Packings	217	662
Pistons: fluid	4	128
Plates: retainer	851	1,021
Plungers	29	19,600
Punchings: rotor	2,089	2,129
Rings: lantern	18	32
Rings: packing	30	132
Rods: piston	56	1,323
Rotors	2	100
Shaft: centrifugal pump	1	56
Sleeve: coupling	1	642
Stators	4	47
Valves	18	411
Valve seats	18	253
Miscellaneous pump parts	1	20
		$ 38,455
TOTAL POWER PUMPS AND PARTS		$ 71,199

15. WELL SERVICING AND TREATING EQUIPMENT

Fracturing head with connections	1	970
EQUIPMENT FOR SWABBING		
Cups: 2"	228	598
Cups: 2½"	270	903
Rubbers	48	138
		$ 1,639
TOTAL WELL SERVICING AND TREATING EQUIPMENT		$ 2,609

16. GAS AND OIL TREATMENT EQUIPMENT	No.	Value ($)
Dehydrators	3	12,180
Gas and oil separators, complete with controls and accessories	2	1,669
Gas and oil separators, vertical type, complete, with valves and fittings	2	2,603
Precipitators	1	1,074
		$ 17,526
parts		
Valves: metering	60	9,746
Valves: oil	18	1,473
		$ 11,219
parts for metering valves		
Adapter assemblies: register	6	1,097
Bridge assemblies	3	64
Rotor assemblies	6	274
Sideplate assemblies	1	59
		$ 1,494
TOTAL GAS AND OIL TREATMENT EQUIPMENT		$ 30,239
17. STORAGE TANKS AND PARTS		
Size		
250 bbl. 12 ga. painted	2	1,475
250 bbl. 12 ga. galvanized	2	2,007
500 bbl. 12 ga. painted	3	3,279
500 bbl. 12 ga. galvanized	15	22,582
750 bbl. 12 ga. painted	2	2,893
Size and gauge unknown	2	2,246
		$ 34,482
parts		
Decks with channels, manhole domes, staves, packings and bolts for 1,000 bbl.	2	7,644
Filter water	2	1,178
		$ 8,822
TOTAL STORAGE TANKS AND PARTS		$ *43,304*
18. ELECTRICAL AND ELECTRONIC EQUIPMENT		
Boxes: connector	14	220
Breakers: circuit	13	1,039
Clamps: "C"	10	138
Connectors: cable	20	75
Connectors: cord	6	56
Dome reflector units	12	322
Flat reflector units	16	392
Guards: steel, for light units	200	343
Plugs: box	50	269
Switches: safety	36	1,050
Transformers	2	56
Wire: ground	2,500 ft.	23
Miscellaneous items	—	307
TOTAL ELECTRICAL AND ELECTRONIC EQUIPMENT		$ 4,290

19. INSTRUMENTS, GAUGES, INDICATORS, REGULATORS AND EQUIPMENT FOR ANALYSIS		No.	Value ($)
Alarm units: instrument		23	2,198
Balances: mud		14	277
Centrifuges: mud, parts		—	729
Chromatograph: gas		1	1,116
Compasses		2	212
Drift recording instruments and parts		2	2,429
Gauges		4	702
Gauges: pressure	4½" face, 2,000 lb.	12	249
	4½" face, 3,000 lb.	6	120
	— — 8,000 lb.	1	310
	No description	5	148
Gauges: pressure, parts		—	925
Indicators: weight, parts		—	1,002
Regulators: pressure		5	323
Viscometers		7	2,682
TOTAL INSTRUMENTS, GAUGES, INDICATORS, REGULATORS AND EQUIPMENT FOR ANALYSIS			$ 13,422
GRAND TOTAL — OIL WELL DRILLING EQUIPMENT (August, 1960)[1].			**$2,543,663**

1. BASED ON AN EXAMINATION OF INVOICES VALUED AT $1,000 AND OVER

IMPORT CLASS 5185

O.D.	Wt/Ft	Grade	Range	Footage		Value ($)
STEEL OILWELL CASING (Seamless)						
—	—	—	—	—		3,416
3½"	7.5 lb.	—	—	8,016′		4,533
4½"	9.5 lb.	—	—	3,841′		2,878
4½"	9.5 lb.	J-55	2	51,395′		43,486
4½"	11.6 lb.	J-55	2	4,950′		4,780
5½"	15.5 lb.	J-55	2	1,788′		2,307
5½"	17 lb.	N-80	2	1,850′		2,861
6¼"	13 lb.	—	—	2,540′		2,478
7"	—	—	—	—		1,020
7"	20 lb.	J-55	2	1,175′		3,210
9⅝"	36 lb.	J-55	2	1,652′		4,674
10¾"	—	—	—	—		274
13⅜"	48 lb.	H-40	2	1,018′		4,879
						$ 80,796
SHOT HOLE CASING						
3"	—	—	—	21,000′		6,567
STEEL OILWELL TUBING (Seamless)						
—	—	—	—	—		3,512
—	—	—	—	6,229′		4,815
2⅜"	4.7 lb.	J-55	2	43,122′		24,216
2⅜"	4.7 lb.	N-80	2	23,338′		21,911
2⅞"	6.5 lb.	J-55	2	12,199′		7,887
3½"	7.5 lb.	—	—	5,519′		3,141
4½"	12.75 lb.	J-55	—	7,304′		10,895
						$ 76,377
TUBING JOINTS (Seamless)						
1¼"	2.3 lb.	—	—	210′		72
1¼"	2.4 lb.	J-55	—	10,009′		11,903
2"	4.6 lb.	—	—	5,575′	(used)	1,639
2⅜"	4.7 lb.	J-55	2	—		6,286
2⅜"	4.7 lb.	N-80	2	—		3,595
2⅞"	6.5 lb.	J-55	2	2,009′		1,911
3½"	9.3 lb.	N-80	2	8,796′		4,681
						$ 30,087
PUP JOINTS						
2"	—	J-55	—	24′		548
2⅜"	—	N-80	—	224′		1,613
2½"	—	J-55	—	54′		548
3"	—	J-55	—	20′		162
4½"	12.75 lb.	—	—	20′		172
						$ 3,043
CASING SHOES						
6¼"	—	—	—	—	(used)	146
DRIVE PIPE SHOES						
8"	—	—	—	—	(used)	58
OILWELL DRIVE PIPE JOINTS						
8"	24 lb.	—	—	260′	(used)	362
SUCKER RODS						
¾" x 25′	—	—	—	40,000′		13,054
GRAND TOTAL — STEEL OIL COUNTRY GOODS						**$ 210,490**

TABLE IV

ESTIMATED IMPORTS OF OIL AND GAS DRILLING EQUIPMENT, 1960

BY SUMMARY CLASSIFICATION AS INDICATED IN TABLE III

1.	GEOPHYSICAL PROSPECTING EQUIPMENT	$ 372,000
2.	DRILLING UNITS	821,400
3.	DRILLING EQUIPMENT	18,351,847
4.	ANCILLARY DRILLERS' EQUIPMENT	1,514,500
5.	BLOW OUT PREVENTERS AND PARTS	125,000
6.	DOWN HOLE – PRESSURE CONTROLLING AND MEASURING DEVICES	291,000
7.	CEMENTING EQUIPMENT	726,000
8.	PERFORATING EQUIPMENT	221,000
9.	WELL LOGGING EQUIPMENT	464,600
10.	WELLHEAD COMPLETION EQUIPMENT	1,562,600
11.	FITTINGS	254,000
12.	VALVES AND PARTS	1,255,700
13.	PRODUCTION PUMPS AND PARTS	2,404,800
14.	POWER PUMPS (n.e.s.)	963,900
15.	WELL SERVICING AND TREATING EQUIPMENT	26,900
16.	GAS AND OIL TREATMENT EQUIPMENT	420,000
17.	STORAGE TANKS AND PARTS	518,000
18.	ELECTRICAL AND ELECTRONIC EQUIPMENT	55,700
19.	INSTRUMENTS, GAUGES, INDICATORS, REGULATORS AND EQUIPMENT FOR ANALYSIS	174,000
20.	RIGS	847,000
	TOTAL IMPORTS $1,000 OR MORE	$31,369,947
	TOTAL IMPORTS (S.C. 5482)	$35,833,542
	PERCENTAGE OF SPECIFIED VALUE TO TOTAL VALUE	87.5%

information

Firms wishing further information and assistance concerning product descriptions, plant location, technical problems, marketing advice and many other industrial problems would be well advised to consult the appropriate provincial departments listed below. You are invited to write or visit their offices where you will be extended the utmost co-operation and technical assistance.

ALBERTA

Department of Industry and Development,
Edmonton.

J. E. Oberholtzer,
Deputy Minister.

BRITISH COLUMBIA

Department of Industrial Development,
Trade and Commerce,
Victoria.

T. L. Sturgess,
Deputy Minister.

MANITOBA

Department of Industry and Commerce,
352 Legislative Building,
Winnipeg 1.

R. E. Grose,
Deputy Minister.

NEWFOUNDLAND

Department of Economic Development,
St. John's.

A. Johnson,
Deputy Minister.

NEW BRUNSWICK

Department of Industry and Development,
P.O. Box 1150,
Fredericton.

J. A. Paterson,
Deputy Minister.

NOVA SCOTIA

Department of Trade and Industry,
Halifax.

V. M. Knight,
Deputy Minister.

ONTARIO

Industrial Development Branch,
Department of Commerce and Development,
454 University Avenue,
Toronto 2.

F. J. Lyle,
Director.

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